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ABSTRACT

This examination of high schools in Massachusetts raises questions about the meaning of the high school diploma and the role, if any, of state policymakers in influencing its meaning. The study shows: (1) students with different characteristics (e.g., male, female, white, minority) and from different kinds of communities and with different socio-economic backgrounds take different patterns of courses; (2) academic tracking, which sorts students into different ability groups, establishes a system of different high school experiences for different groups of students; and (3) even courses with the same title and offered at the same level vary widely in content. Three options for exerting influence on curriculum content are examined: (1) local control of curriculum and promulgated state curriculum guidelines; (2) local control of curriculum except for a core of state-mandated course offerings; and (3) direct state influence on course content, material and outcomes. Although the primary focus of the study is on differential access to courses and programs, significant differences in academic experience were found to occur. The question is raised of whether the facts of differential access, impact of background factors, academic tracking and content variations between courses with the same title indicate problems needing both public discussion and consideration by state level policymakers. (JD)

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THE HIGH SCHOOL EXPERIENCE IN MASSACHUSETTS

APRIL 1986

BUREAU OF RESEARCH AND ASSESSMENT

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EXECUTIVE SUMMARY

"The High School Experience in Massachusetts" is the second of a two-part study by the Department of Education, examining the curriculum of Massachusetts high schools. The first report, "Course-taking Among Massachusetts High School Students," disclosed that, while Massachusetts students took about the same quantity of courses as did their national counterparts, the characteristics of the courses they took showed a significantly higher concentration in academic subject areas and in higher levels of courses than students nationally. Despite this, the findings of the current study raise questions about the meaning of the high school diploma and the role, if any, of state policymakers in influencing its meaning.

The most important finding of the study is that a high school diploma lacks any singular meaning. It lacks this meaning because, as the study shows:

- students with different characteristics (e.g. male, female, white, minority) and from different backgrounds (e.g., kinds of communities, socio-economic) take different patterns of courses.

- students with different goals take different patterns of coursework.

- academic tracking, which sorts students into different ability groups, establishes a system of different high school experiences for different groups of students.

- even courses with the same title and offered at the same level vary widely in content.

To make any substantial change in the high school curriculum (and, therefore, in the meaning of the diploma) will require focusing on the content or knowledge presented to students. Focusing on the quantities of coursework will influence only the form, not the substance, of school programs.

The study's final chapter examines three options for exerting influence on curriculum content:

- local control of curriculum and promulgated state curriculum guidelines

- local control of curriculum except for a core of state-mandated course offerings

- direct state influence on course content, material and outcomes

Each of these options involves hard choices and consequences which may be acceptable to some but not all members of the public. The choices frequently pit one set of values and beliefs against another and involve offsetting good and bad consequences.

The study was based on a detailed examination of 3,000 transcripts from a random sample of 1984 graduates who participated in regular education programs. Students in vocational programs were not included in the study. The findings noted some key characteristics describing who takes what in Massachusetts high schools:

- Males take fewer total courses but more academic and college preparatory courses than females while the latter take a far greater number of business courses.

- White and minority students take about the same number of total courses but white students average one more course in academic subjects and three more college preparatory courses.

- Students from residential suburbs take more courses in academic areas and at higher levels of difficulty than students from other types of communities while students in industrial suburbs take the lowest number of academic courses at lower levels of difficulty.

- Students of parents with a college education take significantly more academic coursework and at high levels of difficulty than students from homes with parents having less than a high school diploma.

The interaction of gender, race/ethnicity, community background and parental education affect not only the amount and type of coursework students take but also their educational goals. High academic students are disproportionately white, live in residential suburbs and have parents with college degrees. Those with strong occupational orientation are overwhelmingly female, live in industrial suburbs and have parents with relatively low educational attainment. Those enrolled in programs with a non-directed or general orientation tend to be disproportionately male, minority and from large cities with parents having low educational attainment.

Academic tracking, in theory, allows students to adjust the level of their coursework according to their strengths and weaknesses; to individualize their programs so that, for example, a student can take an honors level English course and a standard college preparatory mathematics course at the same time. The study shows, however, that tracking in practice is quite different:

- within the same subject area most students continue to take courses at the same level of difficulty as when they began

- across subject areas most students take coursework at the same level of difficulty

- what movement between levels that does occur is predominately downward

- high level academic tracking begins at eighth grade for many high performing students who are predominately from residential suburbs, white and have parents with college educations.

Although the primary focus of the study is on differential access to courses and programs, even when students are exposed to courses with the same title and offered on the same level, significant differences in academic experiences can occur. The study's examination of textbooks, lesson plans, assignments and final examinations in standard college preparatory Algebra I and United States History courses found substantial variation in homework, length of periods, materials used and depth and breadth of topics covered even though the titles of the courses were the same.

The study concludes by raising the question of whether the facts of differential access, impact of background factors, academic tracking and substantial content variations between courses with the same title indicate problems needing both public discussion and consideration by state level policymakers.

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CHAPTER 1

Introduction

Over the past fifty years, a significant change in the process of secondary school education has been a redefinition of the role of choice in determining a student's high school curriculum. In the past, a student elected a particular program of studies - the college program or the business program, for example- and that choice determined the specific set of courses that would comprise the student's high school education. Students earned differentiated diplomas that represented very distinct bodies of knowledge based on this fundamental choice made early in their high school careers.

This model of secondary schools' response to individual differences in educational purpose no longer characterizes most high schools. Over the last twenty-five years, high schools have, in theory, eliminated this "tracking" and allowed students to make choices about each individual course taken during high school. Besides expanding the scope of student choice, schools typically establish requirements that are broad and minimal, and apply them to all students who receive diplomas. These requirements usually stipulate a particular quantity of coursework that is needed for graduation - two years of mathematics, for example - but do not dictate that all students take any particular course - for example, Algebra I.

A parallel and related development in secondary schools has been the proliferation of course offerings in almost all disciplines. Along with the ability to make choices by course, students often have a large array of courses representing a wide variety of knowledge, from which to choose. Math courses, for example, may range from Basic Arithmetic to Calculus, and each counts equally toward fulfilling the math coursework requirement.

In addition to offering a large number of distinct courses, high schools use another approach to respond to individual differences. A single course (for example, Algebra I) may be offered at a number of levels of difficulty, each assigned the same course title, but not presenting identical material.

A significant analytical consequence of broadening the arena of student choice and increasing the variables from which students may choose is the inability to define precisely what constitutes a high school education. This limitation contributes to the notion that a high school diploma has become "meaningless." Insofar as this notion refers to the lack of an immediate and obvious understanding of what an individual's high school program has included, it is accurate. If, however, it is intended to mean that the knowledge represented by a high school diploma is of limited value, the statement is problematic. Although many reform initiatives rest on the assumption that

increased student choice is directly related to a decline in educational quality, there is little factual information to support this assumption.

The most reliable and valid way to know what comprises students' curricula is to record and examine the specific course selections made by individual students. However, the labor intensive effort required to gather such data - in the absence of computerized record-keeping - has limited the number of such projects undertaken. As a result, little data exist to indicate whether the combination of increased student choice, the proliferation of courses and levels of courses, and the establishment of broad, minimum requirements has resulted in an unsatisfactory high school program for all (or for some) students.

Nevertheless, discussion often centers on minimum graduation requirements, expressed in terms of quantity of coursework, both as an indicator of declining standards and as the appropriate means for changing the nature of high school students' curricula.[1] Minimum graduation requirements are consequently increased, often without any information as to whether students already take the required coursework and without consideration of how course offerings and leveling practices may change in response to the increased coursework requirement. It does not necessarily follow, for example, that increasing the required years of mathematics from 2 to 3 will result in more students taking Algebra I.

This report summarizes the findings of a study that examined the courses taken by a sample of Massachusetts public high school graduates from the Class of 1984. The study was designed to provide some insight into the process and content of a high school education for students in Massachusetts. Its focus was on the process component of the high school experience - coursework actually taken - not on the outcome or extent of student learning. Three particular questions frame the analysis:

1. What is the nature of the actual curriculum taken by high school students?

2. Is there a common core of courses taken by virtually all students, regardless of post-secondary plans?

3. How equitable is the distribution of knowledge represented by the coursework of high school students?

A detailed description of the methodology of the study is presented in Appendix A.

[1]See, for example, A Nation At Risk, the report of the National Commission on Excellence in Education.

CHAPTER 2

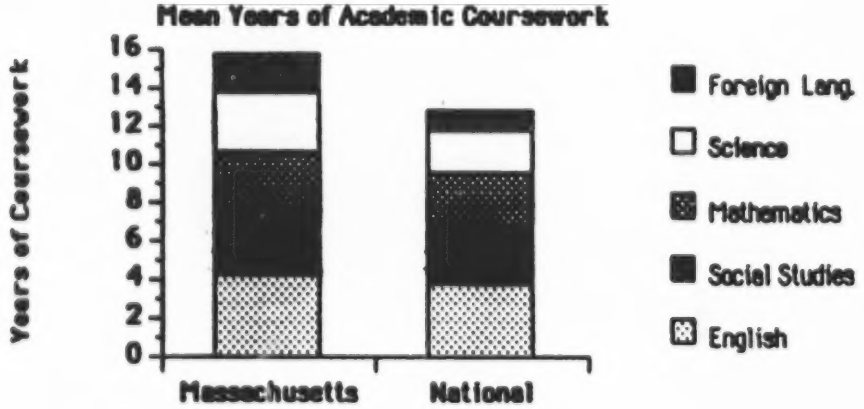
The Nature of the High School Curriculum

Who Takes What?

The first step in describing what constitutes a high school education is to determine how many courses students take, in what subject areas, and at what level of difficulty. This information was presented in detail for Massachusetts students as a whole and as compared to the national average in the previous report of this study, "Course-Taking Among Massachusetts High School Students" (June 1985). The following summary details the major conclusions of that report.

Students in Massachusetts take approximately the same amount of coursework during their four years of high school as do students nationwide. A high school education typically includes almost 22 years of coursework.[2] The distribution of these courses among subject areas by Massachusetts students, however, does not match the distribution pattern evident among students in the rest of the country.

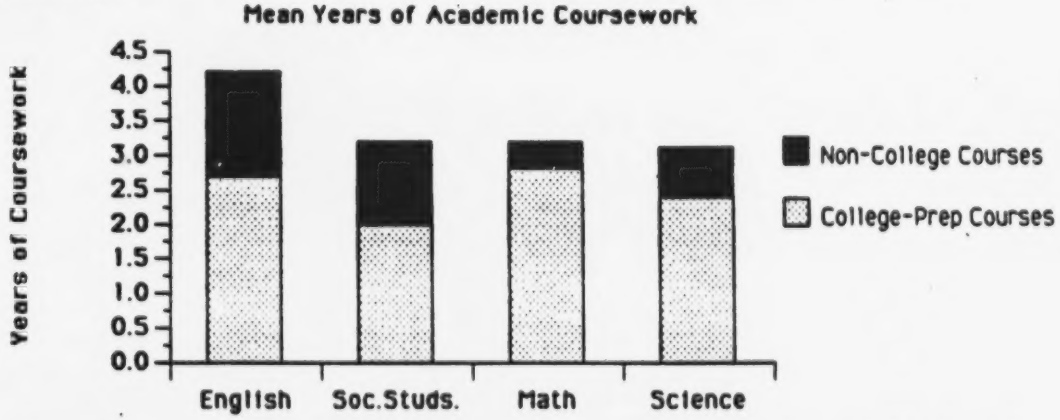
Massachusetts students, in the aggregate, take a pattern of coursework that is more heavily weighted toward academic courses (approximately 75% of their total coursework) than their national counterparts. Every comparison that can be reasonably made (given the problems with comparing data collected using widely divergent methods) shows that Massachusetts students are involved in a more academic high school curriculum than students elsewhere.



[2] A "year of coursework"is equal to the standard unit of credit awarded by schools in the study for a year-long course.

Although Massachusetts high school students take the same total number of courses as are taken by students nationwide their program is substantially more academic than is typical elsewhere. Students typically substitute more academic courses for courses in non-academic areas, such as art and music. With the exception of business courses, Massachusetts students devote no more than one year of coursework to any non-academic discipline.

In addition, a large proportion of Massachusetts students' courses are taken at a college preparatory level. Almost 54% of all coursework - including over 82% of all math courses - is taken at this level of difficulty. Almost 40% of the Massachusetts graduates took at least one course at the highest level (Honors or Advanced Placement) of college preparatory difficulty.[3]



Large percentages of students are involved in traditional course sequences in the mathematics and science areas. More than 60% of the graduates take Biology, Algebra I and II. Almost 60% took Chemistry and 83% take Algebra I. These figures are all substantially higher than those for students in the rest of the nation. This difference was observed even when the participation rates for all Massachusetts students were compared to only those students nationally who reported themselves to be in an "academic" track.

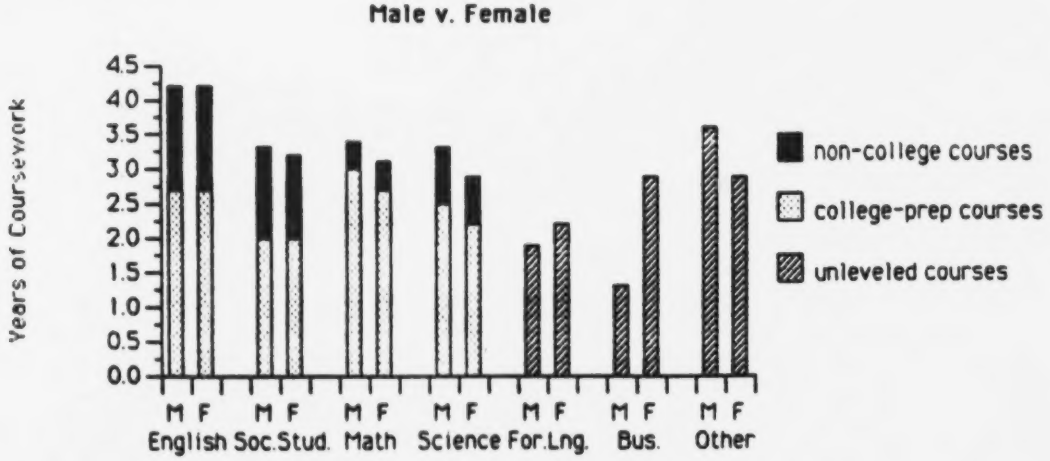
	"Academic" Students Nationally	All Students in Massachusetts
Biology	83.1%	87.2%
Chemistry	45.9%	59.4%
Physics	24.1%	29.5%
Algebra I	73.3%	83.1%
Algebra II	52.0%	64.0%
Geometry	74.8%	74.8%

[3]The level and course categories used in the study are described in Appendix B

Thus, the previous report demonstrated that, overall, the high school education of Massachusetts students is more concentrated in the academic subject areas and in higher levels of courses than the curriculum taken by students in the rest of the nation. However, the average figures presented in that report, by definition, mask the variation that exists in the course-taking behavior of Massachusetts students. The aggregate picture of the coursework of Massachusetts students, while accurate as a description of the average student, is not true of some student groups. In fact, the pattern of course selection among particular sub-groups of students shows significant variation from the average.

MALES AND FEMALES

The coursework of male and female students differs slightly in a number of characteristics. Although male students take a smaller total number of courses than female students, males take more academic and more college preparatory courses. Male students' programs include more years of social studies mathematics and science. Female students take more coursework in foreign languages.



One characteristic of female students' coursework is the substantially greater number of business courses taken. Females across the state average almost 3 years of business courses, and more than 30% of the female graduates take four or more years of business. For these 30%, at least one quarter of their high school experience is occupied by business courses. Males in the regular high school program do not exhibit a parallel pattern in either business courses or in male-dominated courses such as industrial arts. Only 15% of male students take 4 or more years of courses in these areas. Male students pursuing vocational programs may be more likely to enroll in vocational high schools

not included in this study.

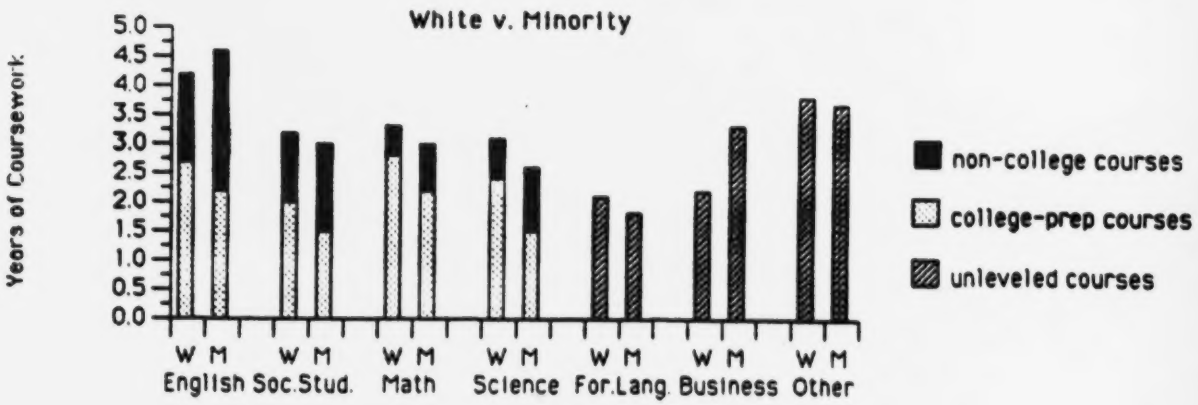
The business focus of a large percentage of female students indicates that, independently from vocational education programs, female students have created a concentrated vocational curriculum within the comprehensive high school. Females who take at least four years of business courses average almost six business courses during high school. Almost 80% of these courses can be classified as skills courses, such as shorthand, typing and bookkeeping. As a result, the typical high school experience of female students is substantially different from that of male students.

WHITE AND MINORITY STUDENTS

(For the purposes of this analysis, the data for Black and Hispanic students will be aggregated into one set of figures for minority students. The sample does not allow for meaningful statements to be made about the courses taken by students in other minority groups.)

White and minority students take the same amount of total coursework, but this coursework is distributed differently for each group, and the level of coursework, as well as participation in particular courses, differs by an even greater extent.

Specifically, white students average almost one more academic course than minority students who substitute an additional year of business coursework for this academic coursework. In particular, minority students take fewer science, math and foreign language courses than white students, as well as slightly fewer years of social studies.



Although minority students take fewer academic courses overall, they take a higher number of English courses than white students. The additional English coursework is typically devoted to Business English or remedial reading. Further, minority students average one-half fewer years of college preparatory English courses than white students.

The differences in the composition of the high school experience of minority students extend to participation in specific courses and levels of coursework as well. In each of the academic subject areas, minority students take fewer years of college preparatory coursework than do white students. Overall, white students average almost three more college preparatory courses in their high school careers than do minority students.

This pattern of substantially lower participation in high level coursework among minority students is paralleled by lower participation in specific courses. For example:

- 20% of all white students participate in at least one honors level English course while only 8% of minority students do so.
- 14% of all white students take Calculus; only 2% of minority students take Calculus.
- 14% of all white students take Algebra I in the eighth grade; only 3% of minority student take eighth grade Algebra.
- 41% of all white students take at least one course at the highest level of difficulty (honors or advanced placement); only 13% of minority students take such a course.

Minority students also exhibit substantial differences from white students in their participation in traditional core courses. For example, while 75% of all white students take college preparatory biology, just over 50% of minority students take the course. Minority students' participation in such traditional courses is high compared to national figures, but it is consistently much lower than the participation rate of white Massachusetts students in these courses.

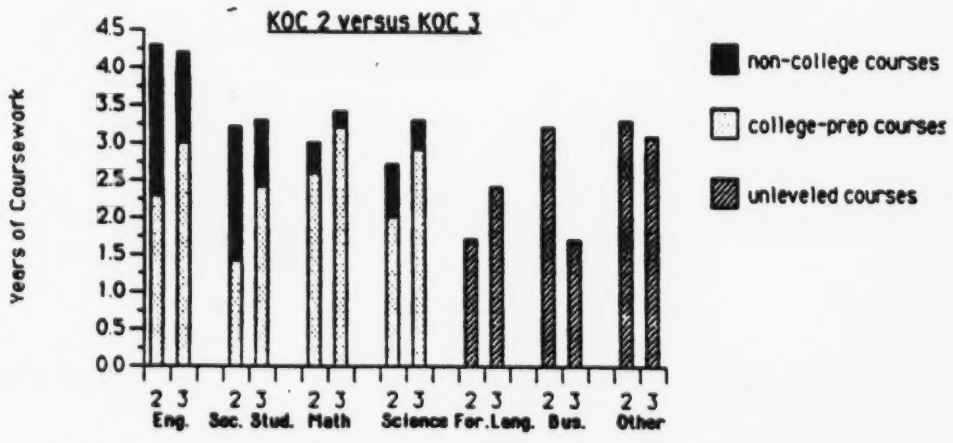
The conclusion from all the data available is that the curriculum taken by minority students is not the same as that taken by white students. The heavy concentration of academic and higher level coursework evident in the figures for Massachusetts students overall is not typical of the pattern of minority students' coursework.

STUDENTS IN DIFFERENT KINDS OF COMMUNITIES

The composition of a student's high school curriculum also varies depending on the kind of community[4] where the school is located. Participation in a highly academic curriculum is not universal among students from each type of community. In particular, students attending high school in Residential Suburbs (KOC 3) are likely to take more courses from the academic subject areas and at a higher level of difficulty than other students. KOC 3 students average the highest total of academic courses (almost 17) and take more than 62% of these courses at a college preparatory level. They are also much more likely to take Calculus and computer coursework than are students from any of the other three kinds of communities. In addition, they exhibit a particularly low participation rate in business courses. More than 35% of the KOC 3 students take no coursework at all in business.

In contrast, students from KOC 2 (Industrial Suburbs) do not typically take a curriculum concentrated on academic, college preparatory coursework. They take the lowest total of academic courses among the four kinds of communities and take a substantially lower number of college preparatory level courses (fewer than 10). In addition, the programs of these students are characterized by more courses at a lower level of difficulty.

Since students in KOC 2 do not take fewer total courses than other students, coursework in non-academic disciplines is clearly being substituted for the academic courses taken by KOC 3 students. The most typical substitution occurring among KOC 2 students is in business courses. KOC 2 students average almost twice as many years of business coursework than do students in KOC 3. In contrast to the 35% of KOC 3 students who take no business courses, 35% of KOC 2 students take four or more years of business courses.

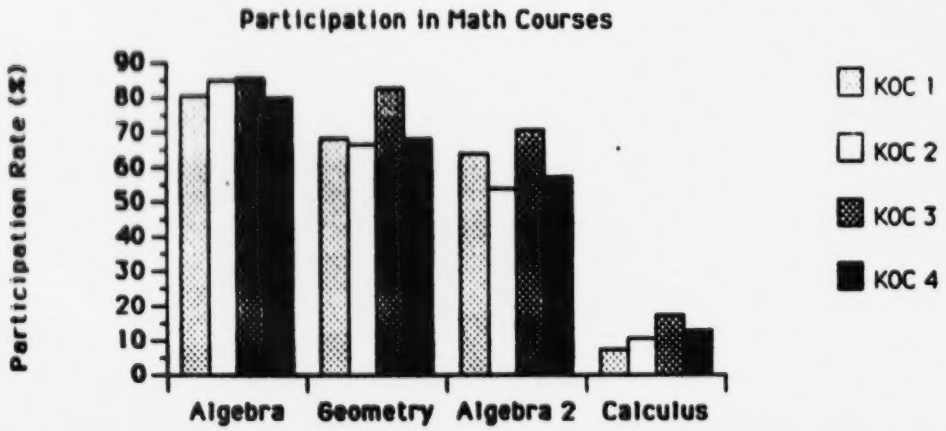


[4]Descriptions of the four kind of community categories are provided in Appendix C

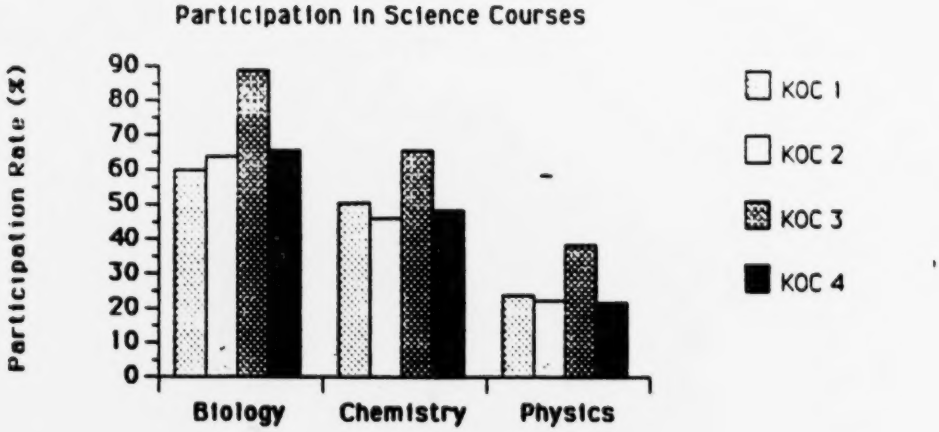
The curricula chosen by KOC 1 (Large Cities) and 4 (Other) students, although less concentrated in academic, college-preparatory coursework than that taken by KOC 3 students, are closer to that pattern than to the coursework of KOC 2 students. Students in Large Cities (KOC 1) take the second highest total number of academic and college preparatory coursework. These students, however, are least likely to participate in coursework at the highest level of difficulty (honors or advanced placement), but those students in KOC 1 who do take such courses average a particularly high number of honors courses.

Students from KOC 4 communities display a less consistent pattern in course taking. Although their coursework is more academic in its focus than that of KOC 2 students, it also includes the highest average of industrial arts courses. In addition, students from this category are more likely to take courses that are unleveled, most probably due to a higher incidence of small schools among the KOC 4 communities.

The substantial difference in the high school programs of KOC 3 students is quite evident in the participation rate of students in traditional course sequences in math and science. Although the participation rate in Algebra I shows small differences from students in the other KOC's, the gap widens considerably after Algebra I. For example, 71% of KOC 3 students take Algebra II while only 54% of KOC 2 students take the course.



Participation in science courses follows a different pattern. Substantially more KOC 3 students participate in each course of the sequence, ending with a Physics participation rate almost double that of the other three KOC's.



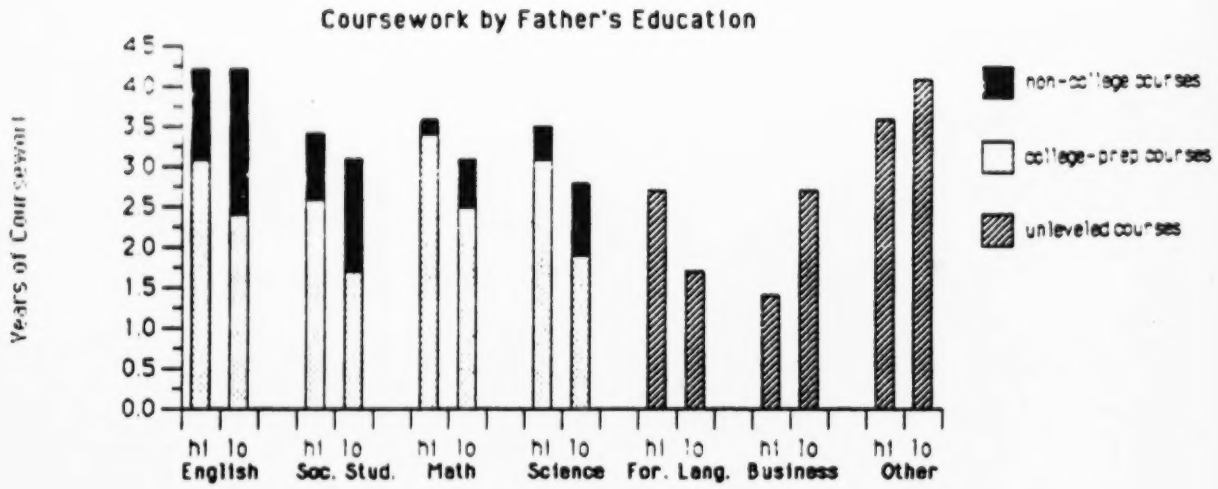
Thus, the nature of a student's high school curriculum differs markedly depending on the kind of community in which the student attends school. Students in residential suburbs are much more likely to be involved in academic coursework at higher levels of difficulty than students attending school in the other kinds of communities. Students in industrial suburbs are substantially more likely to include a heavy concentration of business coursework in their high school programs.

PARENTS' EDUCATION

Perhaps the most dramatic differences in the nature of the high school curriculum experienced by particular groups of students are evident when the programs of students whose parents have different levels of educational attainment are compared. Students' high school experience clearly varies depending on the level of education achieved by their fathers.

Students whose fathers attained no more than a high school diploma take a high school program with an entirely different focus from students whose fathers obtained at least a college diploma. In particular, students whose fathers received at least a college diploma take more total coursework during high school, 3.5 more years of academic coursework, and almost 5 more years of college preparatory coursework.

The difference in course totals occurs in every academic subject area except English. The years of coursework in math, science and foreign languages are substantially higher for students whose fathers obtained at least a college degree. Students whose fathers obtained no more than a high school diploma take substantially more coursework (1.3 years) in business.



Participation in specific courses also varies between the two groups of students:

- 24% of the students whose fathers have at least a college degree take Calculus; only 8% of the students whose fathers have no more than a high school diploma do so.
- 52% of the students whose fathers have the most education take some computer coursework; only 13% of the students whose fathers have the least education take computer coursework.
- 46% of the students whose fathers have a college degree take a foreign language course in the eighth grade; only 24% of students whose fathers have no more than a high school diploma do so.

In every category of comparison, students whose fathers' educational attainment did not go beyond a high school diploma show substantially less concentration in academic and high level coursework. A student whose father attained the highest levels of education is likely to be involved in a high school program directed to reproducing that level of attainment.

These descriptions of the high school programs of particular groups of students demonstrate how race, gender, and socio-economic status are correlated with the nature of a student's high school experience. Of the three, socio-economic status is the most difficult to identify. Information on income, education and occupation is often used to approximate socio-economic status. This study used data collected from students on father's level of educational attainment as the primary indicator of socio-economic status. In addition, the kind of community classification helps to identify socio-economic status since one criterion used to define the community categories is income.

The sample communities representing each kind of community exhibit different percentages of high ($50,000) and low ($10,000) family income and minority representation.

	% High Income (> $50,000)	% Low Income (< $10,000)	Minority Representation
KOC 1	1 9%	36 5%	11 9%
KOC 2	2 0%	30 9%	4 9%
KOC 3	10 4%	16 7%	2 8%
KOC 4	2 5%	20 6%	1 2%

It is apparent that kind of community analysis is related to the race and socio-economic differences.

The discussion of the coursework differences based on race, gender, parents' education and kind of community presents the findings as if each of the demographic characteristics were independent of each other. It is unlikely that each factor operates independently and, therefore, the nature of their interrelationship needs to be examined.

Although methodology does exist to provide detailed information about this question, the sample size used in this study does not permit comparison of white and minority students controlling for father's education. Using KOC as a rough indicator of socio-economic status, the high school program of minority students in KOC 1 differs from that of white students in KOC 1. In fact, the differences between the two groups are larger than those observed among white and minority students from all types of communities. The gap between the amount of college preparatory coursework, in particular, is larger between white and minority students in KOC 1. Thus, after controlling for KOC 1, an approximation of socio-economic status, white and minority differences still exist.

One limitation of this analysis is the concentration of important factors among KOC 1 students. A majority of the minority students (Black and Hispanics) reside in KOC 1 communities; KOC 1 communities have the highest percentage of low income families; and KOC 1 students have a high percentage of fathers with low levels of educational attainment. Sorting out the relative influence of each of these factors with more certainty would be possible with a larger sample size. Based on the data available, all that can be said is that the importance of race as an independent factor affecting high school programs cannot be ruled out.

Investigating the high school curriculum taken by students with particular characteristics clouds the neat, positive picture of high school curriculum provided by the overall figures. Information on the courses typically taken by sub-groups of students leads to the clear conclusion that involvement in a highly academic, college preparatory curriculum is not an experience shared equally by all students. The data raise the question of why certain kinds of education experiences are being systematically chosen by (or chosen for?) students with particular characteristics and from particular backgrounds.

CHAPTER 3

Differentiated Curricula

Providing appropriate secondary education for an increasingly wider range of students has posed a consistent challenge to high schools over the last one hundred years. From the 1880's when fewer than 10% of the 14-17 year olds were in high school, to the present when virtually all attend for some period of time, high schools have had to debate whether all students, regardless of educational goals, should study a common curriculum or whether differentiated curricula related to particular educational goals should be available.

From the report of the Committee of Ten in 1893 to the Cardinal Principles in 1918 to the Commission on Excellence in 1982, pressure has been placed on high schools to address this issue. However, the accepted view about the proper nature of their response has shifted over the years. Formal programmatic tracking, establishing sharply differentiated curricula for separate groups of students, was a prominent feature of high schools in an earlier era; today, virtually all high schools assert that no such tracking of students occurs. Viewed as contrary to equal opportunity and the principle of preserving the option of post-secondary education, systems that tracked students - as college preparatory, business/vocational or general, for example - have been phased out. The prevalent view of what a comprehensive high school should do does not include sorting students into clearly identifiable groups. Indeed, substantial support exists for the notion of a common curriculum, incorporating the idea that there should be no difference in the kind of schooling required as preparation for college and the kind required for entry into the workforce.

However, despite claims to the contrary, systematic sorting of students does exist within today's high schools. Although the process may be less formal than that of earlier times, an examination of the coursework taken by students shows considerable "tracking." Two general ways in which differentiation occurs are important:

1. Differentiation by educational goals whereby students preparing for college take a course of studies that is substantially different from that taken by students for whom high school is likely to be the end of their education.

2. Differentiation by levels of academic coursework whereby students are sorted ostensibly according to their interest and ability in each academic subject area.

In contrast to the earlier approach that differentiated students into groups early in their high school careers and allowed for little mobility among these groups, the theory of today's high schools dictates that students have the flexibility to choose a program directly suited to their needs. Although the theory is held to be true by virtually all high schools, the actual practice results in a pattern of differentiation not unlike that found in the past.

PROGRAMMATIC DIFFERENCES

Despite the elimination of different courses of study for high school students, coursework patterns clearly related to particular educational goals are evident. The previous report of this study identified three types of curricula differentiated by educational goal, which differ substantially from the typical curriculum described by the aggregate figures for all students. These are:

- A "high academic" curriculum characterized by a strong academic orientation with a high quantity of academic coursework and a high percentage of courses taken at higher levels of difficulty.

Non-college preparatory curriculum included two paths:

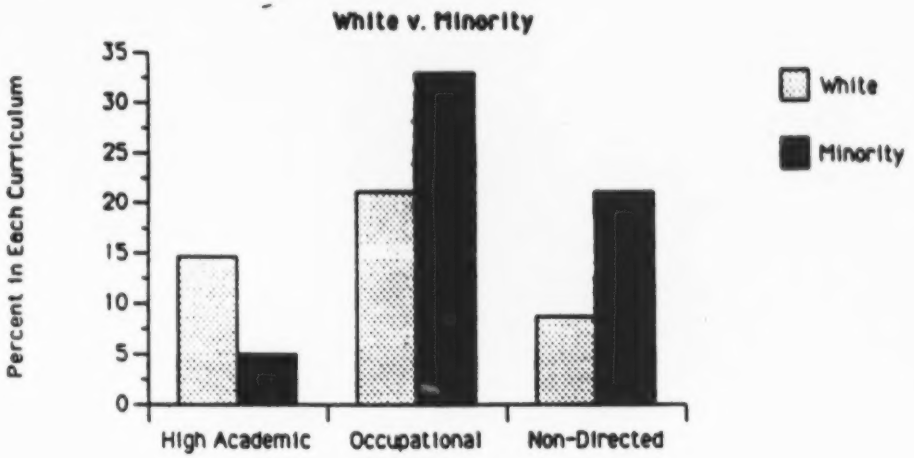
- A curriculum characterized by strong occupational orientation with a low quantity of academic and higher level coursework and an identifiable concentration in an occupational subject area (business, home economics, industrial arts)

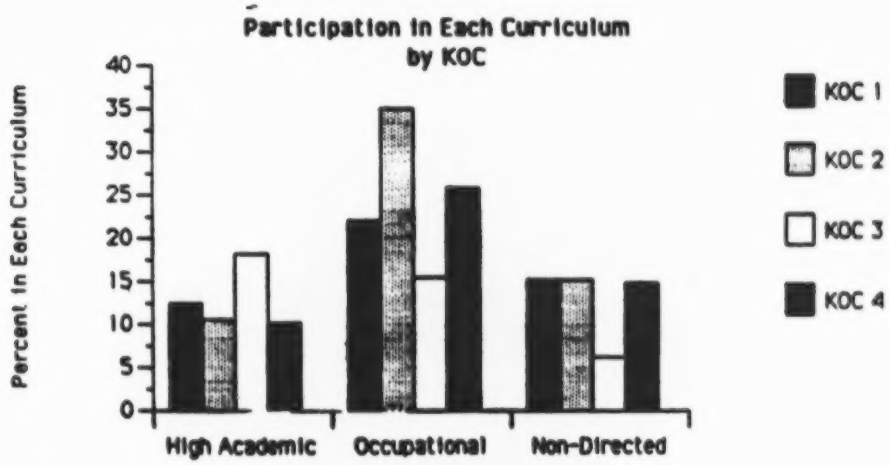
- A curriculum characterized by a "non-directed" or general orientation with a low quantity of academic and higher level coursework and no identifiable concentration in an occupational subject area.

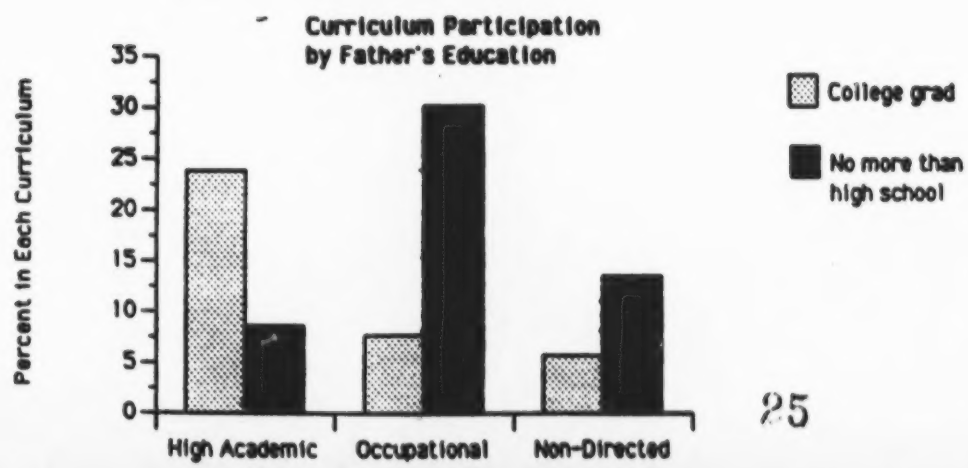
A significant number of all students were involved in each of these curricula - high academic - 14%; occupational - 21.6%; and non-directed - 11.4%. However, these curricula are followed by students with markedly different demographic characteristics.

Students who take a High Academic curriculum are disproportionately white, from KOC 3 and have fathers who have attained at least a college degree. The student population taking an occupational curriculum is disproportionately minority, from KOC 2 and overwhelmingly female, and has fathers with the lowest amount of education. The non-directed curriculum has over-representation of minority students and students from KOC 1, and has substantially more male students and students whose fathers have the least education than would be expected if the participation were equitable.

These figures indicate that students do not have an equal likelihood of participating in each of the typical curriculum paths found in secondary education. Students in industrial suburbs(35%) are more likely to be in an occupational program; minority students(33%) are more likely to be in a non-directed program; and students whose fathers have more education (24%) are more likely to take an intense academic program.







The existence of a differential course of studies has been chararacteristic of high schools as long as they have had the need to respond to a more hetereogeneous student body. Whether by explicit organizational structure or by a more loosely designed process, one clear result of secondary education is that students are sorted and prorated with a curriculum appropriate to different educational goals. Equity questions are raised when it seems clear that all students do not have an equal likelihood of pursuing the curriculum paths available.

A separate issue involves whether the coursework of secondary students with different educational goals should be substantially different. The appropriateness of a common core of knowledge necessary for students regardless of their life goals is an issue that remains on the educational agenda. Strong opinions exist as to whether preparation for college ought to be different from preparation for work. As described previously, interest in the notion of a common curriculum has increased greatly during the current wave of education reform. An obvious question arising from that interest is "to what extent do students already take a common curriculum?"

First, the quantity of coursework taken is common among most students. Students take about the same total number of courses and, to a large extent, a similar quantity of coursework in many subject areas.

Second, a set of specific courses is taken by almost 80% of all students - Algebra I, Biology, English I, English II and American History. The "common core" evident in the coursework of Massachusetts students includes at least one course from each academic subject area except foreign languages. Along with physical education, this set of courses constitutes the commonality present in a high school education. It should be emphasized, however, that participation in these courses is not universal among students.

Further, it is inaccurate to describe these courses as a "common core" without considering the fact that high school curriculum typically offers each of these courses at various levels of difficulty. It is very likely that, despite the commonality of the title of the courses, commonality of content does not exist to the same extent. In order to have a true common core representing the same body of knowledge, all students would not only have to take Algebra I, they would have to take a course that presented the same breadth and depth of knowledge about algebra. Given the elaborate system of academic tracking that exists in most high schools, it is unlikely that such commonality of content is evident.

ACADEMIC TRACKING

Since a large percentage of Massachusetts students take a curriculum with a strong academic orientation, a description of programmatic tracking does not provide much insight into the curriculum taken by the majority of the students, who are not involved in the more specialized curriculum paths. Knowledge of how academic tracking operates is necessary to understand the high school program of students taking a standard college preparatory curriculum, Establishing a system by which courses with the same title (and ostensibly representing the same knowledge) can be taken at a number of levels of difficulty is another way schools respond to a varied student population. Leveling systems exist in almost all schools but the specific characteristics vary from school to school and sometimes from subject area to subject area. Some schools assign a level of difficulty to every course offered, while others restrict leveling to academic subject areas. Some schools, by design or because of small size, have courses that are unleveled and taken by a heterogeneous group of students.[5]

In theory, offering the same course at different levels of difficulty provides the flexibility needed to select a course of studies suited to each student's abilities. Students ostensibly have the freedom to adjust the level of their coursework from year to year and from subject area to subject area. High school personnel describe this leveling system as a way of responding to students' academic strengths. Students can, they assert, take a lower level English course as freshmen and move to a higher level English course by the time they are seniors. In addition, the system allows a student to take, for example, an honors level social studies course and a non-college preparatory mathematics course. Such flexibility would not have been possible in tracking systems of an earlier era.

School personnel who describe their academic tracking systems in this way are correct - students can follow the patterns they lay out. However, the actual coursework of students shows that the theoretical possibility of such combinations differs from the actual practice. In practice, leveling systems serve a sorting rather than an individualizing function within high schools. Within a subject area, students tend to duplicate the level at which courses are initially taken. For example:

- Over 88% of the students take sophomore English at the same level as their freshman English course.

[5]The levels of difficulty categories used in the study are described in Appendix B.

- Over 80% of the students who take Algebgra I at a standard college preparatory level take Geometry at that same level.

- 92% of the students who take Geometry at a college preparatory level take Algebra II at the same level.

- Of the students who take both Biology and Chemistry, 88% took both courses at the standard college preparatory level.

The levels of coursework across subject areas also appear to be similar; students tend to take most of their academic courses at the same level.

- 54% of the students who take a standard college preparatory English I course take Chemistry at the same level.

- Over 66% of the students who take Biology at an honors level take U.S. History at the same level.

Thus, the flexibility usually stated as a strong feature of the academic leveling system does not exist in practice. Although the system allows some mobility among the levels, most students tend to duplicate the same levels both within and across subject areas.

The limited mobilty that does exist is overwhelmingly downward in its direction. In mathematics courses, no more than 5% of students who begin at one level ever move to a higher level of coursework in subsequent courses. For example, of those students who take Algebra I at a standard college preparatory level, only 3.4% take Algebra II at a higher level of difficulty.

However, the amount of mobility that occurs among levels of coursework is not as uniform as it first appears. The system works differently depending on the initial level of coursework taken.

For students who begin at the highest college preparatory level, the academic tracking process is characterized by substantial downward mobility as further sorting of these students occurs. By the time students have reached the end of the traditional course sequences, the participation in honors level courses is greatly reduced from what it was in the first step of the sequence. For example, while 20% of all students take Algebra 1 at the honors level, only 8% take a three-year sequence of courses at the honors level. More than 38% of the students who take honors Biology take Chemistry at a lower level of difficulty.

Students who begin course sequences at a standard, college preparatory level overwhelmingly continue in the same level of coursework throughout the sequence. Little upward or downward mobility occurs.

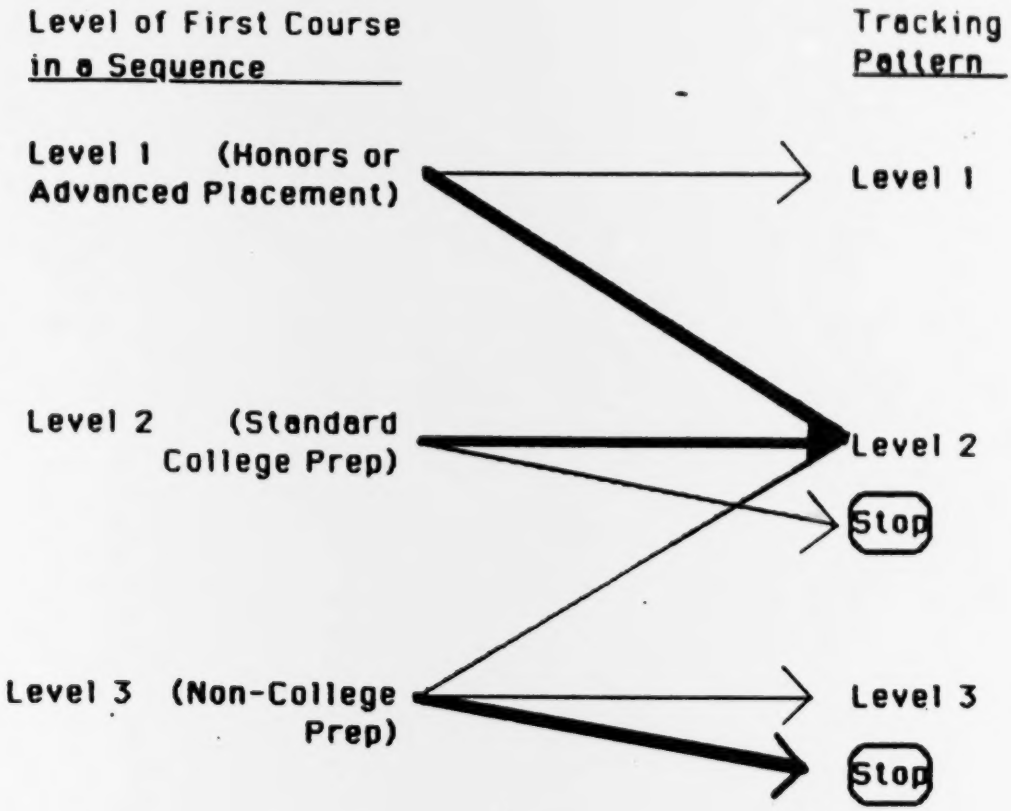
- 82% of the students who take a standard, college preparatory Algebra I course take Geometry at the same level.

- 72% of the students who take level 2 Algebra I take Algebra II at the same level; only 3.4% take an honors Algebra II course.

A partial explanation for the absence of downward movement among students who begin sequences at this level is that, particularly in mathematics and science, courses are not often offered at a lower level of difficulty than standard, college preparatory. For example, a non-college preparatory Chemistry course is not typically an option. As these students progress through traditional course sequences, only two choices are available - continue with standard, college preparatory coursework or stop taking courses in the sequence. In fact, many students do take the second option. As shown above, 72% of the students who take level 2 Algebra I take Algebra II at the same level; another 25% of these students do not take any Algebra II course.

A similar but even more restricted situation exists for students who begin course sequences at a non-college preparatory level. In most instances, no lower level of difficulty is available to those students, other than specialized remedial courses which are offered in some subject areas. Since many courses are not offered at a non-college preparatory level, again only two choices exist - stop taking the sequence of courses or move to a higher level of difficulty. Although some students do continue the course sequence and move up a level, many more stop taking the coursework. For example, 75% of the students who take non-college preparatory Biology do not take a Chemistry course; 17% move to a standard, college preparatory course and 8% stay at the same level of difficulty. In mathematics, the lowest level of Algebra I is typically a course that covers Algebra I over two years. Forty-five percent of the students who take this level of Algebra I do not take Geometry and 69% do not take Algebra II.

Thus, the operation of the academic tracking system can be summarized by the diagram below:



Bold lines indicate the most common path

This model of academic tracking applies primarily to subject areas that are more, rather than less, sequential, in particular mathematics and science. English and social studies, which are much less sequential, have particular features which produce a different tracking pattern. English and to a lesser extent, social studies, coursework is taken by virtually all students during each year of high school. With English, students do not have the option of not taking an English course as they have in the other subject areas. English courses are almost always offered at all levels of difficulty and, as a result, students have the choice of continuing coursework at the same level as the previous year's course. In addition, the absence of clear course sequences in these subject areas makes tracking patterns more difficult to determine. This combination of characteristics results in more balanced upward and downward movement among the levels of coursework and, at the same time, a high percentage of students who maintain their level of coursework from year to year.

This description of how academic tracking operates provides a picture of how sorting students into ability groups for academic subjects establishes a system of very different high school experiences. As noted, the nature of these experiences varies substantially depending on the level of the first course taken in the academic course sequence. An important question to consider, therefore, is, "When are students assigned to these particular levels?" Without detailed information about the tracking practices at earlier levels of education, it is impossible to pinpoint when and how this process takes place. However, information on participation in Algebra and a foreign language in the eighth grade indicates that entry into the "academic elite" may be determined when eighth grade assignments are made, most likely by the end of grade 7. For example, of those students who take both Algebra I and a foreign language in the eighth grade:

- 82% take honors English I
- 86% take honors social studies
- 28% (as compared to 14% in the aggregate) participate in the High Academic curriculum
- 93% take a college preparatory curriculum (as compared to 67% in the aggregate).

Participation in grade 8 Algebra I and a foreign language markedly increases the likelihood that a student will be involved in an elite academic curriculum. These students display the most concentrated academic program of all the sub-groups of students that were examined. Further, their average verbal SAT scores are 80 points above the average and their math scores over 100 points above the average.

- 62% of these these students take Physics compared to 30% of all students
- 53% take Calculus compared to 13% of all students
- 17 of their total number of courses are at the college preparatory levels as compared to 12 of total courses of students overall.

From one perspective, students who take these eighth grade courses have the greatest chance of receiving the "best" that schools have to offer - an intense, academic curriculum. An obvious equity question to consider is what kinds of students take these courses and are, thus, most likely to become members of this "academic elite."

Participation in the two eighth grade courses is most likely to occur among students who are from KOC 3, have fathers who have obtained at least a college degree and are white. Only 2% of minority students (Black and Hispanic) are selected for entry into this academic fast track. Students from KOC 1, KOC 2 and KOC 4 are greatly underrepresented in this group of students.

Male and female representation, however, is just about equal to each group's representation in the high school population. Almost 50% of the students who take both eighth grade courses have fathers with at least a college degree, as compared to 30% of all students. Academic tracking, designed to sort students according to their interests and abilities, has the additional consequence of sorting students according to demographic characteristics.

Much of the criticism of academic tracking is countered by the argument that any existing tracking is the result of students' free choice about courses and levels. The identification of an "academic elite" as early as the end of the seventh grade raises a serious question about the merits of that argument. Course-taking decisions made at the end of grade 7 are less likely to be made by students than by teachers. Student input into the decision to take a foreign language and Algebra I in the eighth grade is likely to be almost non-existent. Given the relationship between taking such courses in grade 8 and the nature of a student's high school program, it is clear that these decisions made primarily by teachers have a large impact on a student's high school experience. Therefore, the role of student choice in creating an individualized high school program is smaller than many would argue.

CHAPTER 4

Course Content

A fundamental argument of this report has been that, because of the complexities in the operation of comprehensive high schools, information about graduation requirements and quantity of coursework provides a distorted picture of high school programs. A logical extension of this argument is that information based on the titles and levels of courses taken by students also gives an incomplete description. To understand course-taking patterns more fully, it is necessary to look at the breadth and depth of knowledge included in course content.

Two sources of information were available to examine the issues related to course content. Transcript data collected included SAT scores which may bear some relationship to the relative rigor of a student's coursework. However, since course content can vary over a wide range of characteristics which typically are not reflected in transcripts, the study collected data from a small number of schools during on-site visits. The study looked at textbooks, lesson plans, assignments and final examinations used in standard, college preparatory Algebra I and U.S. History courses, and collected teacher comments on these two courses.

The study found that substantial variation exists in the content of courses taken by Massachusetts students, even though the titles of courses they take are fairly uniform. The results indicate that high participation in college preparatory coursework, when combined with academic leveling systems, can produce substantial dilution of course content. A comparison of the academic coursework of KOC 1 students and their SAT scores suggests that course content may have to be adjusted in order to accommodate a wider range of students in college preparatory programs. Students in KOC 1 take the second highest number of academic and college preparatory courses among the four KOC's. However, the average SAT scores of KOC 1 students are the lowest among the four groups and 55 points lower than the scores of KOC 3 students.

Exactly what SAT's measure is part of an on-going debate; for the purposes of this argument, however, it is not necessary to decide whether SAT's measure aptitude or achievement. Regardless of how the issue is argued, the implication for course content is clear: including large numbers of students with low SAT scores in college-preparatory courses raises questions about the content of the courses they are taking. For example, how rigorous is a college-preparatory program that includes students with such scores?

One possible answer to this question is that the breadth and depth of course content has to be adjusted to accommodate the range of ability found among the students taking the course.

An examination of standard, college-preparatory, Algebra I courses indicates how this kind of dilution of content occurs. Algebra I is taken by 83% of all students. Many school systems offer four variations of the course: eighth grade honors or high school honors, college-preparatory, and a two-year course covering the material of Algebra I at half the normal pace. The standard, college-preparatory version is taken by about 56% of all students.

Schools generally explain the differences in the four versions of Algebra I either specifically in course descriptions or more generally in the definition of coursework levels that apply to all subject areas. Most often, however, such descriptions refer to the pace of instruction and the amount of independent work required. Although acknowledgement is made that some differences exist among the levels of a course, the extent of content differences is not always clearly articulated. The amount of content dilution that exists is surprising.

The purpose of this discussion, however, is to demonstrate the extent of dilution that <u>can</u> occur in a course considered to be college-preparatory and ostensibly presenting relatively standard material. It does <u>not</u> assert that all standard college-preparatory Algebra I courses are significantly diluted.

The information collected during on-site visits provided insight into the breadth and depth of the course content and homework assignments. The range of topics covered at this level appeared to be standard and not unlike those covered in Algebra I courses at a higher level. Some topics, such as the quadratic formula, are freqently given little or no attention, but in general, most courses seemed to cover the breadth of topics that typically constitute Algebra I.

The depth to which the topics are presented, however, does not always match the conventional notion of what is included in a standard, college preparatory Algebra I course. First, it is not uncommon for this level of Algebra I to avoid the study of word problems entirely. Second, the computational skills required to handle the problems assigned may not go beyond simple arithmetic. For example, any computation involving manipulation of fractions may be eliminated in order to allow students to focus on the algebraic concept rather than a computational skill with which they are likely to have problems. Finally, Algebra courses at the standard college preparatory level often present a "recipe" approach to the subject. The course focuses on teaching students how to do various types of problems (other than word problems). It is not directed toward presenting the concepts of algebraic understanding. Students are not expected to synthesize their knowledge, apply what they know to problem situations, or respond to test questions based on their cumulative, rather than their most recent knowledge. In general, the course may be described as teaching students how to do algebra, but not to understand algebra.

The role of homework in this level of Algebra I is related to the students' inability to work independently in attempting to solve algebraic problems. Teachers appear to make accommodations for the problems that students at this level have in completing ordinary math homework assignments. Often a large portion of the class period is devoted to explaining how the problems assigned for homework should have been done. An extreme of this type of accommodation was found where no homework was assigned at all; class periods were spent with the students working on problems with the assistance of the teacher.

This description of standard, college-preparatory Algebra I indicates a substantial dilution of the depth to which the topics of Algebra I are covered. Although, on the surface, the course corresponds to high-level Algebra I courses, particular features of how the topics are handled show a course that is far removed from the general notion of what a student who has successfully completed college-preparatory Algebra I has done or can do.

Thus, an Algebra I course of this type can be offered under the title "Algebra I," despite the fact that the content associated with this title is thought to be fairly standardized. The existence of such a course supports the idea that academic leveling and broad participation in college-preparatory coursework can result in a dilution of course content as a by-product of trying to accommodate a range of lower ability students.

Another important point concerning variation in course content among courses with the same title is that a course title and a specific level do not necessarily define the same course content from school to school. The transcript data collected suggest why this may occur. For example, in KOC 1, over 28% of the students who took Algebra II received SAT math scores of below 400. In KOC 3, only 12% received similar scores. When so many Algebra II students receive such low scores, a question arises concerning the content of the course these students are taking. In KOC 3, a much smaller percentage of students perform as poorly, and the pressure for content dilution is not as strong. Thus, a relatively advanced course such as Algebra II may vary in content from school to school.

The on-site visits revealed similar variation in the scope of knowledge presented in standard college-preparatory U.S. History courses. One basic characteristic of any course is the amount of instructional time available in which students may learn. Although the use to which instructional time is put is clearly of major importance, available time for instruction is a precondition for learning.

The length of the class period plus homework time add up to the total instructional time available. In the small sample of schools that participated in the on-site portion of the study, the length of the class period varied substantially. One school had class periods that were almost 40% longer than those in

another school. Differences this large must have an impact on the depth and breadth of content covered. An even greater impact must occur when, as was the case, the course with the shorter class period also did not require any homework outside the class.

Unlike Algebra I courses, standard, college-preparatory U.S. History courses varied from school to school in the breadth of topics covered. Covering the intended scope of a U.S. History course, from the European explorers to the present, is an impossible task for most courses at this level. As a result, adjustments are made in the topics covered in order to establish a reasonable syllabus for the course. However, not every course ends up covering the same set of topics. Some condense or eliminate the early history in order to try to reach the present; others concentrate on pre-World War I history and rarely get beyond World War II.

U.S. History courses also vary in the amount of time spent on current events. The percentage of instructional time allocated to discussion of current events ranged from 0% to 20% among the schools visited. More time spent on current events necessarily reduces the range of other topics covered.

While it might be argued that differences in the range of topics covered in any two U.S. History courses are inevitable, differences apparent in the depth of the course content clearly establish that the level of coursework can vary markedly among schools.

First, the use of primary source material was a consistent thread throughout one course from daily assignments and lesson plans to final exams. Students were encouraged to think critically about material written during the era they were studying, and to apply their knowledge of events in describing their significance. Other courses with the same title and the same level did not use any primary source material. Second, some courses involved students in an independent research paper related to the course, while others did not include such an assignment. Third, the tests in some courses included essay questions requiring thinking beyond factual recall. Tests for other courses showed no evidence of requiring anything beyond factual recall; in some cases, tests were limited to multiple-choice and true-false responses. Fourth, the approach underlying some courses encouraged the synthesis of history, requiring students to see connections among events, rather than viewing history as a series of isolated incidents. Other courses clearly presented history as a list of names, dates and places.

Data collected during the on-site visits indicated that course content can vary substantially even among courses with the same title and level. While this study did not seek to explore this variation in course content in depth, it did demonstrate that such variations exist and can be quite pronounced. The small number of site visits do not allow any conclusions about whether extensive content dilution is a common phenomenon.

Rather, they only show that such dilution is possible. A public policy that overlooks this potential variation in content will very likely fall short of its educational improvement objectives.

CHAPTER 5

Policy Options

In many instances, education reform for secondary schools began and ended with increasing minimum graduation requirements. "Reformers" diagnosed weak curriculum as the problem of high schools and devised policies designed to force students to take rigorous rather than frivolous courses. Two problems with their line of reasoning are:

1. At least among Massachusetts students, there is not much evidence that students are devoting a lot of time to frivolous or even non-academic coursework; and

2. There is not much evidence that, within the existing high school framework, increasing graduation requirements alters course-taking behavior in the desired way. In some cases, unanticipated responses to increased requirements have produced effects opposite to what was desired.

It is not surprising, therefore, that a recent survey of high school principals found that minimum graduation requirements were rated as not very significant in improving high schools.[6]

Since there is little evidence to support the common beliefs about either what is wrong with high schools or the best way to fix them, the question becomes: "What, if anything, is wrong with secondary education?" This analysis of high school transcripts provides a detailed picture of the nature and process of a high school education. As shown by course-taking data, secondary education in Massachusetts has the following characteristics:

- differential access to coursework;
- lack of a common core of knowledge presented to all students as a result of programmatic and academic tracking;
- substantial variation among courses assigned the same title due to dilution of course content;
- sorting of students according to demographic characteristics; and
- substantial variation in course content from school to school.

[6]Survey conducted by the Association for Supervision and Curriculum Development

Public debate should focus on whether any of these characteristics indicates a problem with high schools that deserves the serious attention of policy makers. Many of the characteristics can be regarded as responses to important values of American society and thus, as strengths rather than weaknesses. The purpose of this discussion is not to contribute to such a debate, but the study does assume that at least some of the above characteristics will be identified as problems and considers the options available to address these problems.

A fundamental conclusion of this study is that a high school diploma lacks any singular meaning. Any attempt to make a substantial change in high school curriculum must focus on the content or knowledge presented to students. Policies focusing on quantities of coursework ("All students must take 2 years of science.") or on course titles ("All students must take Algebra I.") will influence only the form, not the substance, of high school programs. Thus, if a consensus of opinion is reached about providing some common meaning to a high school diploma, the question should be how to influence the content of courses.

Control of curriculum content can occur anywhere along a continuum starting with teacher and student control of content at one end and strong state control at the other end.

Control of Curriculum Content

At present, Massachusetts follows a model that is further away from state control than most other states. Massachusetts is one of only a few states that does not impose minimum graduation requirements. Many other states (for example, New York) locate substantial control of curriculum at the state level.

If a decision were made to exert a larger influence on curriculum content, many options along the continuum would be available. Three possibilities are:

1. Local control of curriculum content with state guidelines;

2. Combination of local control with state-mandated course offerings; and

3. Direct state influence on course content, materials and outcomes.

Local Control with State Guidelines

As discussed previously, local districts currently can have substantial control over the curricula they offer. Districts differ in the extent to which they exert this control or conversely leave the determination of content to individual classroom teachers. Models exist in which teacher autonomy is high; teachers can select the content presented, for example, by choosing the textbooks used. Other systems provide for less teacher autonomy, attempting to standardize curriculum content throughout the district, using techniques such as district-wide textbook adoption, curriculum guides and testing.

Modifying current practice by allowing local districts to have direct control over the curriculum, but establishing state guidelines for curriculum content would create a relatively unobtrusive state role. Districts would decide whether to adopt, modify or ignore the state guidelines. In the absence of other state initiatives to influence content, such guidelines may have little influence; combined with other indirect efforts, such as testing, however, they may well have a powerful effect. California is developing such model curriculum standards and combining them with a required curricula review in each district.

State-Mandated Course Offerings

A policy relying on state guidelines to influence course content only succeeds to the extent that districts choose to incorporate the guidelines into their curricula. Although such an approach represents a substantial change in the way education is governed in Massachusetts, any policy that does not require particular content to become part of curricula will have no effect in some districts. Because minimum graduation requirements, as commonly delineated, will have, at best, little positive influence on course content, a second option could retain local autonomy over curricula, except for a group of courses that the state would require to be offered. Rather than attempting to provide equity in course availability, a policy of mandated course-offerings would first describe, in detail, the breadth and depth of the course content. Districts would then be required to offer such courses, in addition to whatever other course offerings they wished. Besides preserving substantial district autonomy, this approach would also allow students the choice of selecting a state-mandated offering or some alternative within the parameters established for each school.

The policy adopted by the Massachusetts Board of Regents of Higher Education may be substantially affected by this method of influencing course content. The Board of Regents policy on admission to state colleges and universities requires students to take a particular quantity of coursework in particular subject areas. Unlike typical minimum graduation requirements, however, this Regents' policy stipulates that all coursework required for admission must be taken at a college-preparatory level. Further, in some areas, specific courses are required. The admission eligibility policy leaves the certification of the college-preparatory nature of the coursework to the local district. As

shown in Chapter 4, however, there is substantial variation among schools as to what is considered "college-preparatory." In the current situation, possible consequences of the Regents' policy are that a large number of students taking college-preparatory courses in order to preserve their eligibility for state colleges and universities, and further dilution of course content will result. Thus, although the admissions eligibility policy is intended to improve academic preparation for college, it could have the opposite effect for some students.

Combined with a state policy of mandated course offerings, however, the Regents' policy could avoid that result. With a state policy requiring, for example, that an Algebra I course incorporating a particular breadth and depth of knowledge be offered, an assumption of standardization for students who successfully complete that course would be more reasonable than at present.

Direct State Involvement

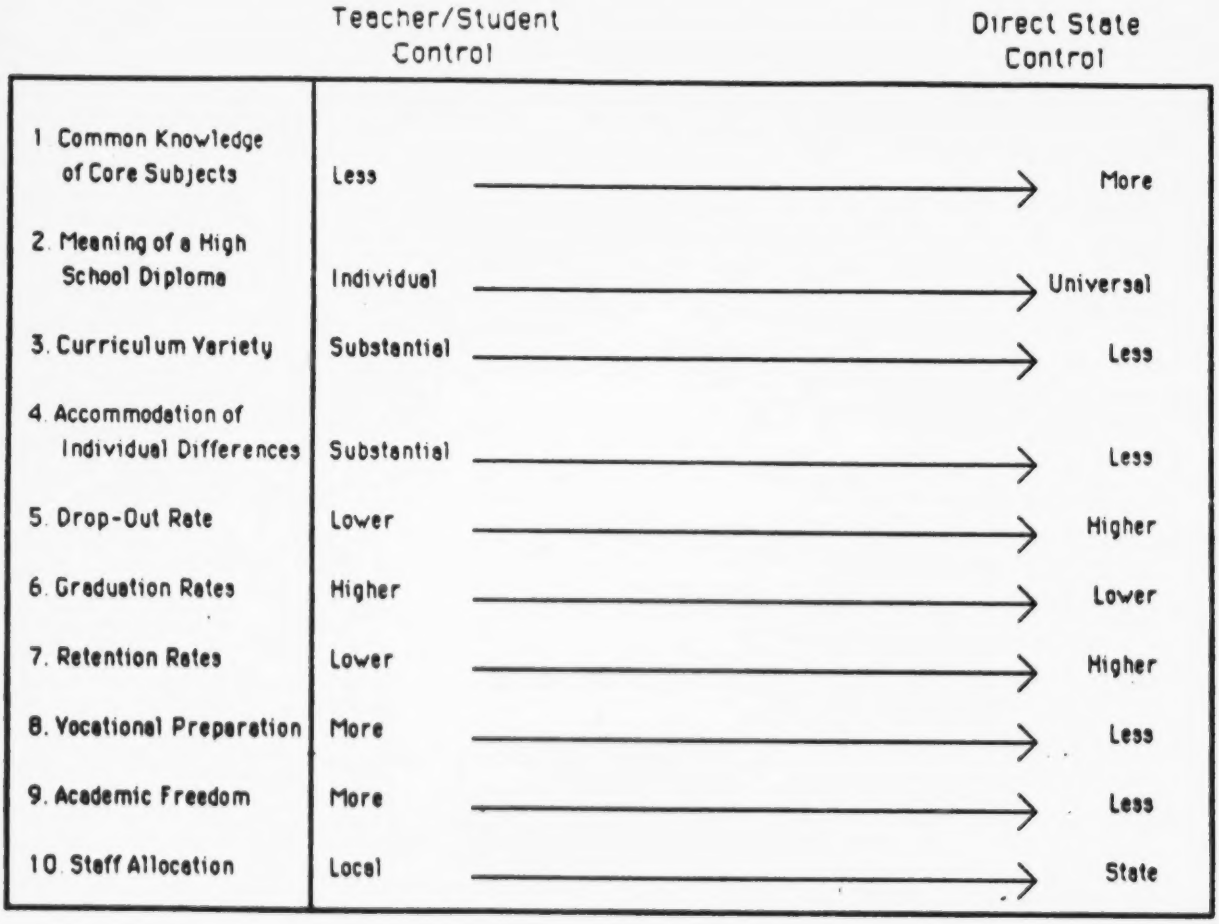
Although both options described represent a significant change for education policy in Massachusetts, they both involve relatively indirect ways of influencing curriculum. A third option is direct state involvement in defining a high school diploma. In this model, the state establishes that, in order to receive a diploma, a student must successfully complete a particular group of courses, and that each course must include a specified breadth and depth of content. States currently use a variety of mechanisms to attempt to have such direct influence over course content, although not all follow the ultimate control model. For example, many states try to control course content by establishing state syllabi; some exert control over materials by statewide adoption of textbooks; and many attempt to control outcomes by using statewide testing of various types. A logical extension of a policy of direct state involvement in defining a high school diploma would be to create state-determined promotion standards for the lower grades and a state-certified diploma.

Consequences

The list of policy alternatives presented above certainly does not exhaust the possibilities available to the creative policy-maker for influencing curriculum content. Each of the alternatives, however, involves hard choices, since none is without important consequences. Thus, any discussion of the merits of the available options should be based on a clear understanding of how these policies are likely to operate in practice.

Moving along the continuum toward more direct state involvement in curriculum content is likely to have a profound effect on many elements of schools and students. Certainly, for example, a state-defined diploma will mean an increased state role; however, implicit in an increased state role is an increase in state regulatory apparatus. Policies that mandate course content, which is ultimately in the hands of the classroom

teacher, must be accompanied by enforcement mechanisms if the substance of change is to occur, and not merely its form.



A number of issues involve students most directly. Curricula determined more by state than by local policy will likely have less variety than exists now. Less curriculum variety will limit the ability of high schools to accommodate a wide range of students. If the curriculum content moves toward a common core of knowledge required to be mastered by all students, drop-out and retention rates are likely to increase, with a corresponding decline in graduation rates. In addition, the vocational (particularly secretarial) preparation currently found in comprehensive high schools may well be curtailed, resulting in students who have fewer skills with which to enter the job market.

Beyond a restriction in academic freedom, any attempt to specify the meaning of a high school diploma is likely to have one significant impact on the teaching staff. As a large number of students become involved in a smaller number of courses, more teachers will be needed in these areas, and fewer in others. For example, the data on the coursework of Massachusetts students suggests that staff resources could be allocated away from business courses toward academic areas. Precisely how this would

occur would depend on what curricula areas a policy might seek to influence. However, any change in the status quo of course taking will have staff allocation consequences.

The various policy alternatives also imply differences in funding. Increased state involvement varies directly with increased state resources. The option requiring the fewest state resources is likely to be the easiest to implement, but may have the smallest impact.

The problem of how to respond to concerns about secondary education is a complicated one. First, philosophies about what high school education should provide differ to such an extent that what the proponent of one sees as a strength, the proponent of another sees as a weakness. For example, some see the variety available in high school curriculum as an impressive accommodation of a wide variety of students, while others see it as the primary reason for a perceived reduction in educational quality. Second, equity issues persist in American education despite serious attempts to address them. In framing a response to these issues, school policy makers have to decide what schools can do to try to ameliorate problems that stem principally from the larger society.

Third, the unintended consequences of policy changes often create difficult dilemmas. In some instances, the practical outcomes of a policy may differ sutstantially from its philosophical intent. For example, one possible way of attempting to eliminate differential access to coursework is to require all students to take coursework presenting a common core of knowledge. While this may reduce the inequity in the courses students take, it could also produce higher drop-out rates among those same students for whom access to coursework was inequitable.

Another dilemma occurs when the implication of policies come into conflict with other strongly held beliefs. An attempt to create a common core curriculum could detract from the goal of increasing graduation rates. Attempts to standardize curriculum content as a way of reducing inequitable variation in high school curriculum would require a substantial change in the long-held tradition of local control of education.

The challenge for education reform at the state level is that the implementation of reform is necessarily modified or even controlled at the lowest organizational unit, the school itself. Given that the distance between policy and implementation is so great, the first step in formulating a response to this challenge is to sharpen the picture about how high schools operate. Good understanding of the process and content of the high school experience will help to avoid policies that are so susceptible to subversion they are meaningless. Secondly, policy makers must determine if any elements of this picture define problems that are appropriate to address at the state level. The final step is to devise a strategy to remedy the problem that will confront and not circumvent the hard choices that are involved.

APPENDIX A

1. Methodology

This study of student coursework involved a sample of Massachusetts students from the Class of 1984. The research design included three components:

- Administration of a questionnaire to students
- Collection of course information from student transcripts
- Examination of course content in a small sub-sample of schools

a. Sampling Design

The transcript study employed a two-stage, stratified sampling design. The first stage involved random selection of comprehensive high schools from within each of the following kind of community categories: KOC 1 - Big Cities; KOC 2 - Industrial Suburbs; KOC 3 - Residential Suburbs; and KOC 4 - Other Communities.

The second stage of the sample selection process selected students from the total eligible enrollment in these schools, with oversampling to allow for sufficient minority representation.

The eligible enrollment consisted of students who were not involved in bilingual programs, alternative programs, substantially separate special education programs or Chapter 74 vocational programs. These excluded students comprised approximately 14.0% of the twelfth grade enrollment. In addition, students who had transferred from other high schools (approximately 10%) were eliminated from the sample because of the difficulty of evaluating the courses found on their transcripts.

While it is not possible to know exactly how the inclusion of these other groups would alter the results of this study. it is possible that the eligibility criteria used has produced a slightly more academic sample than if the sample represented all students. In particular, special education, bilingual and alternative program students might take a somewhat less academic program than other high school students. On the other hand, the Department's August 1984, study of graduation requirements showed that students in vocational schools are subject to substantially higher graduation requirements in the academic areas than students in other types of high schools. Thus, the nature and the extent of the differences caused by the sampling procedure are impossible to state exactly.

It should be noted, moreover, that the largest single group of ineligible students were transferees from other schools. No obvious differences exist between the coursework of such students and that of other students.

This sampling design allows generalizations to be made to students in Massachusetts, students in each kind of community and minority students in Massachusetts. The data from the study are not generalizable to schools in Massachusetts, to schools in each kind of community or to individual schools in the study. In addition, no reasonable estimates for minority sub-groups are possible within the limitations of the sampling design.

b. Description of the Sample

The final sample of 2898 students had the following composition:

Sex

Male	44%
Female	56%

Race/Ethnicity

White	93.2%
Black	2.2%
Hispanic	1.2%
Other	1.2%
No response	2.2%

Kind of Community

KOC 1 (Large Cities)	18.4%
KOC 2 (Industrial Suburbs)	11.3%
KOC 3 (Residential Suburbs)	42.9%
KOC 4 (Other Communities)	27.4%

Father's Education

Did not complete high school	12.5%
Completed high school or equivalent	29.4%
Completed business, trade or vocational school	10.7%
Completed some college but did not graduate	7.3%
Graduated from a four-year college	17.0%
Completed an advanced degree	12.6%
Don't know	6.3%
No response	4.2%

Post-High School Plans

Working	19.7%
Attending a school or college of less than four years	18.3%
Attending a four-year college	52.9%
Entering military service	4.3%
Other	2.4%
No response	2.4%

c. Components of the Research

The first stage of the research involved a questionnaire

administered to all students in the sample eliciting information on their sex, race, post-high school plans, parents' educational attainment, amount of homework and paid employment. A summary of the responses to the questionnaire items is found in the first report of this study.

The second stage of the study, the transcript analysis, involved the development of a comprehensive system of classifying courses and translation of the courses found on student transcripts to the categories of this system. The classification scheme consisted of a meaningful and efficient list of courses or course categories with which to organize the course information. In addition, it used a generic system of academic levels that incorporated the leveling practices found in schools.

The development of this scheme involved examination of the catalogs of course offerings from Massachusetts high schools, discussions with curriculum specialists from several high schools and adaptation of classification schemes used in prior studies.

The design and implementation of a reliable process for matching courses to the scheme included information drawn from the school catalogs and input from personnel of each school in the study. Each course offered by the sample schools was matched to the classification scheme categories prior to data collection.

Information was collected from student transcripts on the courses for which credit had been awarded and the number of years of coursework the course represented. The data collected did not include when the course was taken or the grade earned.

The schools in the study used a variety of systems for awarding credit to a course. For this study, a standard unit of credit - equal to one year of coursework - was adopted. The data collection process related the credits appearing on a student transcript to this standard unit of credit.

The third stage consisted of on-site visits to three schools included in the study to investigate the question, "Does course content differ among schools and, if so, in what way does the variation occur?" The unit of analysis for this portion of the study was the course as defined by the participating schools. The focus of the study was on the content of the course unit, not the knowledge gained by students enrolled in the course. Two specific courses were studied - Algebra I, at a standard, college preparatory level and U.S. History at the standard, college preparatory level.

Five general questions provided the framework for the on-site visits:

1. What is the difference in the courses offered at each level in the school?

2. What are the characteristics of the students taking a course at each level?

3. How does the pedagogy differ by level?

4. What is the breadth of the course content?

5. What is the depth of the course content?

Information collected during interviews and from documents provided by school staff was used to address these questions. In each school, the principal, the guidance department chairperson department heads of mathematics and social studies and teachers of the two specific courses participated in individual interviews. In addition to the interviews, these participants provided the following documents for the study:

1. course catalog
2. description of levels of course difficulty
3. class schedule
4. curriculum guides
5. course prerequisites
6. course requirements
7. course syllabi
8. course textbooks
9. course supplementary textbooks
10. lesson plans
11. copies of tests and final examinations

APPENDIX B

COURSE CLASSIFICATION SCHEME

DEFINITIONS OF COURSE CATEGORIES

Category 1	Courses intended to prepare students for admission to extremely competitive four-year colleges.
Category 2	Courses intended to prepare students for admission to most four-year colleges and more selective two-year colleges.
Category 3	Courses intended to prepare students for other post-secondary training and education as well as immediate employment.
Category 4	Courses intended to serve a heterogeneous group of students or those that do not fit into one of the other categories.
Category 5	Courses intended to provide remediation of basic skills.

COURSE DIRECTORY

1. English

Code #	Title (and Alternatives)	Description
101	English 9 (English I, 1, Sophomore English)	genre study; reading, writing and speaking skills; vocabulary study
102	English 10 (English II, 2, Sophomore English)	genre study; reading, writing, listening and speaking skills; vocabulary study
103	English 11 (English III, 3, Junior English	reading, writing, listening and speaking skills; literature selections not limited to American or English writings
104	English 12 (English IV, 4, Senior English	reading, writing, listening and speaking skills; literature selections not limited to American or English writings

105	American Literature (American Authors, American Writers, American Literature Survey)	reading, writing, listening and speaking skills; study of American writings
106	English Literature (Major British Writers, British Literature Survey)	reading, writing, listening and speaking skills; study of British writings
107	Composition (Writing Lab, Advanced Composition, Basic Composition, Essay Writing, Creative Writing, Expository Writing)	principles and techniques of selecting, combining, arranging and developing ideas and expressing them in appropriate written form, such as narration, exposition or persuasion
108	Literature, Special Topics Contemporary Fiction, Shakespeare, Mythology, Poetry, The Short Story, Science Fiction, Non-Fiction)	reading and critiquing of particular authors, themes, genres or periods of literature
109	Communications (Mass Media, Journalism, Film, Advertising, Television Production, Speech, Debate, Performing Drama)	study of the creation, transmission and evaluation of messages
110	Reading (Remedial Reading, Developmental Reading, Speed Reading)	
111	Business English	development of language skills for use in business contexts
112	English Courses Not Elsewhere Classified	

2. Social Studies

201	American History (U.S. History)	historical survey of U.S. domestic and foreign affairs
202	European History	history and culture of European nations
203	World History (World Geography and World Culture, History of World Civilization)	cultural and political survey, ancient and modern; western and non-western civilization
204	Ancient History (Ancient World History, Development of Civilization, Early World History)	ancient civilization; Africa, Asia and Middle East; cultural and artistic contributions
205	History, Special Topics (Twentieth Century America, Westward Movement, Civil War, Mexican History)	study of particular historical periods or themes
206	Social Sciences (Psychology, Economics, Sociology, Anthropology)	study of behavior and organizations of people
207	Cultural Studies (Asian Studies, Latin American Studies, African Studies, Afro-American Studies)	study of the history, society, politics, culture and economics of a particular geographic region or a subset of the population
208	Government and Law (Civics, State and Local Government, American Government)	study of the description and analysis of political institutions and processes
209	Social Studies Courses Not Elsewhere Classified	

3. Mathematics

Sequential Courses

301	Remedial Math (Basic Math, Math Lab, Basic Skills Math, Arithmetic Review)	computational skills, basic math skills
302	Practical Math (General Math, Applied Math)	math applications, whole numbers, fractions, decimals
303	Algebra I, two-year sequence (Algebra I, Parts 1 and 2)	Algebra I over two years; reduced pace
304	Algebra I, one-year sequence	graphs, algebraic equations, radicals, linear equations algebraic proofs, mathematical symbols
305	Geometry	logical proofs, area, planes, congruence, similarity
306	Algebra II (Intermediate Algebra)	polynomials, irrational numbers, verbal problems, logarithms, binomial theorem, trigonometry
307	Pre-Calculus (Trigonometry, Analytic Geometry, Trigonometry and Solid Geometry, Algebra and Trigonometry, Introductory Analysis, Linear Algebra, Algebra III)	sequential math courses beyond Algebra II but not including calculus
308	Calculus	differential and integral calculus, analytic geometry topics, limits, functions

Non-sequential Courses

309	Business Math	development of math skills for use in business contexts
310	Mathematics, Special Topics (Probability and Statistics, Review Math)	

311	Mathematics Courses Not Elsewhere Classified	

4. Science

Life Science

401	Biology I	human body, functioning plants, functioning animals, ecological relationships
402	Biology II (Advanced Biology, Biology 2)	second level course; biochemistry, microbiology, genetics
403	Life, Science, Special Topics (Zoology, Botany, Anatomy, Physiology, Marine Biology)	

Physical Sciences

404	Introduction to Physical Science	
405	Physics II (Advanced Physics)	motion, energy, electricity, mechanics, gravity
406	Physics II	
407	Chemistry I	changes in composition, mole concept, oxidation and reduction, bonding, equilibrium
408	Chemistry II (Advanced Chemistry)	structure of matter, chemical kinetics, solution chemistry
409	Physical Science, Special Topics (Electricity and Magnetism, Relativity)	

Earth and Environmental Sciences

410	Earth Science	survey course, geology, astronomy, metereology, fossils
411	Earth Environmental Sciences, Special Topics (Oceanography, Geology, Astronomy	

412 General Science

413 Science Courses Not Elsewhere Classified

5. Foreign Language

Foreign Language I	vocabulary, grammar, culture study, listening and speaking
Foreign Language II	vocabulary, grammar, culture study, listening and speaking
Foreign Language III	vocabulary, grammar, culture study, composition and literature; listening and speaking
Foreign Language IV	literature, written essay, conversation, culture, geography study; listening and speaking
Foreign Language V	reading of the classics; listening and speaking; composition and literature
Conversational Foreign Language	practical speaking

501	French I	516	German IV
502	French II	517	German V
503	French III	518	Conversational German
504	French IV	519	Latin I
505	French V	520	Latin II
506	Conversational French	521	Latin III
507	Spanish I	522	Latin IV
508	Spanish II	523	Other Lanuages I
509	Spanish III	524	Other Languages II
510	Spanish IV	525	Other Languages III
511	Spanish V	526	Other Languages IV
512	Conversational Spanish	527	Other Languages V
513	German I	528	Other Languages, Conversational
514	German II	529	Language Courses Not Elsewhere Classified
515	German III		

6. Business Education

Secretarial and Clerical Skills Courses
(Typing, Shorthand, Office Procedures, Transcription)

Study of the skills needed to record and transcribe communications, to provide administrative support and to record, duplicate, classify and retrieve correspondence and data.

601	I	first year course
602	II	second year course
603	III	third year course
604	IV	fourth year course

Bookkeeping and Accounting

Study of the process of systematizing information about transactions and activities into accounts and quantitative records.

605	I	first year course
606	II	second year course
607	III	third year course
608	IV	fourth year course
609	College Accounting I	
610	College Accounting II	
611	Business Education, Special Topics (Marketing, Business Law, Business Economics)	
612	Distributive Education	marketing, store location, display, merchandising, production information
613	Work Study	
614	Introduction to Business/General Business	
615	Business Education Courses Not Elsewhere Classified	

7. Industrial Arts

701 Technical Drawing I, II, III, IV
(Mechanical Drawing, Drafting, Engineering Drawing)

702 Industrial Arts Courses

8. Home Economics

801 Home Economics

9. Music/ Performing Arts

901 Performance
(Band, Orchestra, Chorus, Wind Ensemble, Music Lessons)

902 Theory
(Composition, Arranging, Conducting)

903 Appreciation
(Music History, Music Literature, Folk Music, Jazz)

904 Dramatic Arts

10. Art

1001 Studio
(Sculpture, Painting, Ceramics)

1002 Appreciation
(Art History)

11. Computer Science

1101 Introduction to Computers

1102 Introduction to Programming — flow charts, algorithms, computer languages, machine operation, documentation

1103 BASIC

1104 Pascal

1105 Other Programming Languages
(FORTRAN, COBOL, C, LOGO)

12. Interdisciplinary Courses

1201 Interdisciplinary Courses

13. Courses Not Elsewhere Classified

1301 Courses Not Elsewhere Classified
(Guidance, Service)

APPENDIX C

KOC Definitions

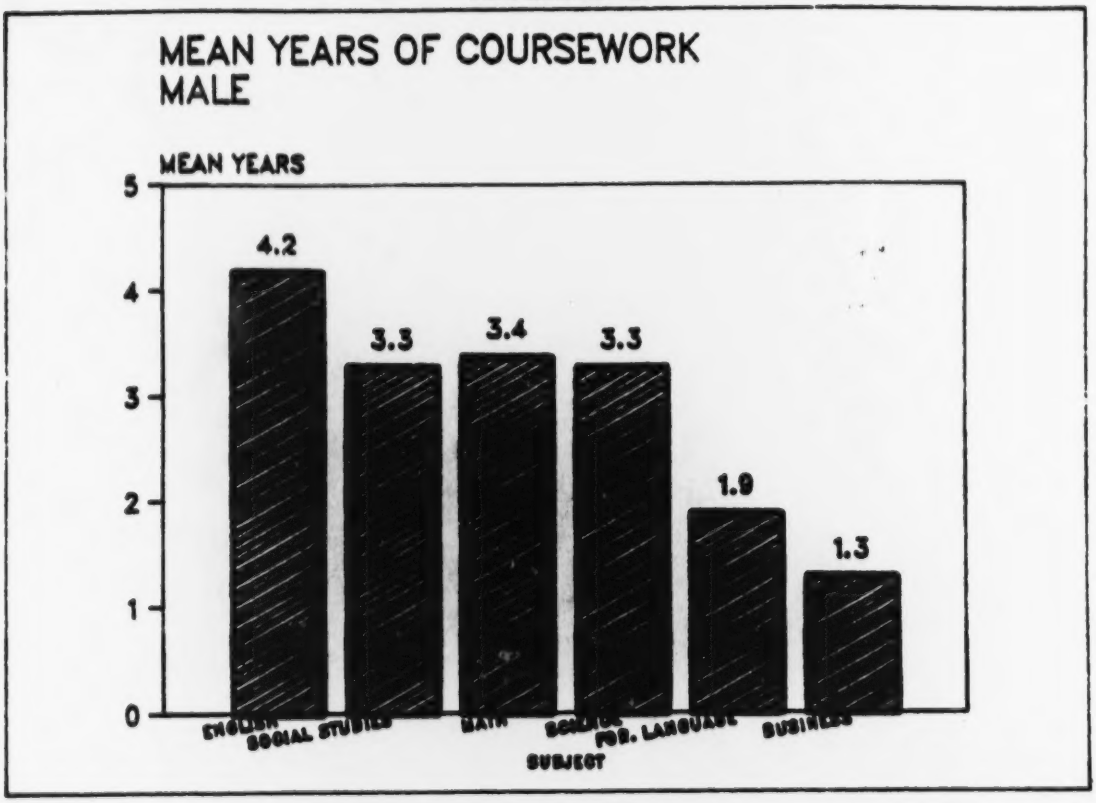
KOC 1: **Big Cities** generally refer to communities designated as central cities according to the 1970 United States Census. Examples of Massachusetts big cities include Brockton, Haverhill, Holyoke, Lawrence, Worcester.

KOC 2: **Industrial Suburbs** generally include three types of communities: suburbs in the innner Boston circle with below average family income and with more than 20% commercial and 7% industrial land use; suburbs in the outer Boston circle with below average family income and with more than 20% commercial land use; and suburbs of central cities other than Boston with below average family income and with more than 20% commercial and 7% industrial land use. Examples of industrial suburbs are Cambridge, Chelsea, Medford, Quincy, Peabody, Waltham, Lee and Monson.

KOC 3: **Residential Suburbs** generally fall into three categories: suburbs of Boston (not industrial suburbs) with average family incomes up to $16,000; suburbs of Boston (not industrial) with average family incomes over $16,000; and suburbs of central cities other than Boston with above average family incomes. Examples include Arlington, Braintree, Framingham, Scituate, Walpole, Andover, Dover, Milton, Newton, Chelmsford, Shrewsbury, Wilbraham.

KOC 4: **Small Towns and Other Communities** generally include the following types: resort towns in the Cape Cod area; resort towns in the Berkshire area; suburbs of cities other than Boston (not industrial suburbs) with less than average family income; towns with below average family income and industrial/commercial land use; towns with below average family income that are non-industrial, non-commercial and non-resort areas; and communities with a population of less than 2,500 inhabitants but not resort areas. Examples of small towns and other communities include Barnstable, Chatham, Yarmouth, Stockbridge, Bridgewater, Hadley, Oxford, Stoughton, Newburyport, Taunton, Ayer, Kingston, Orange, Webster, Ashfield, Dunstable, Plympton.

APPENDIX D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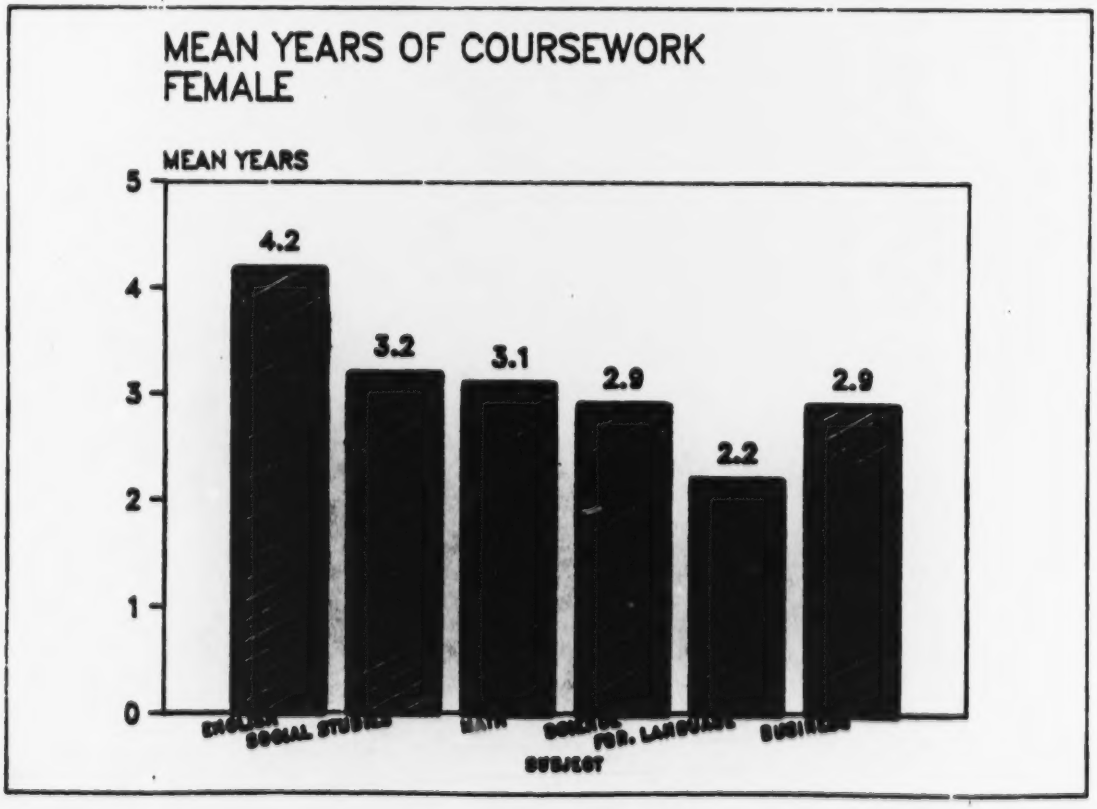
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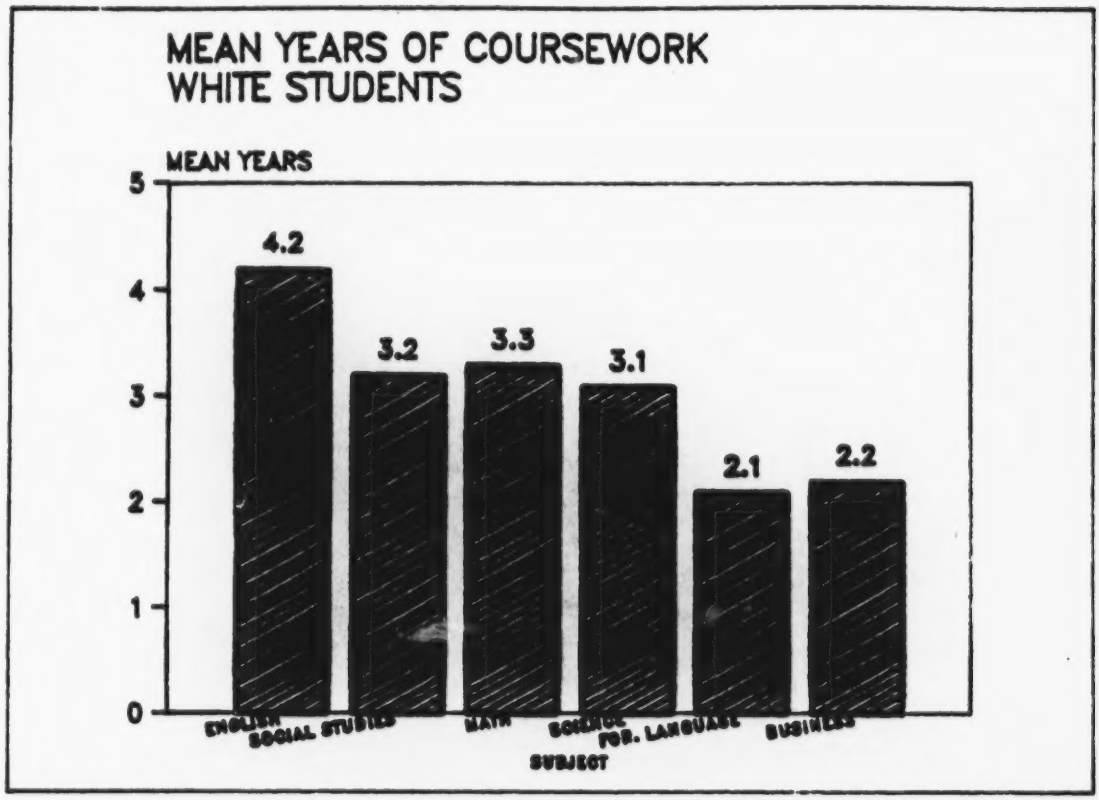
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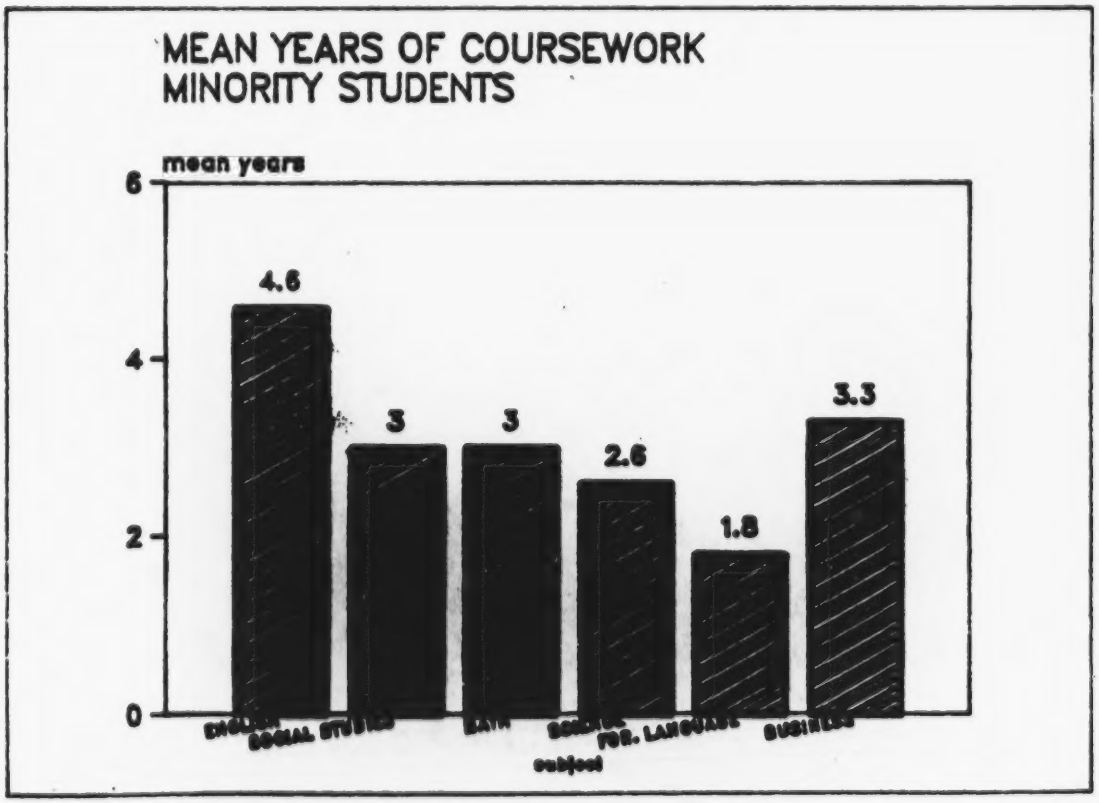
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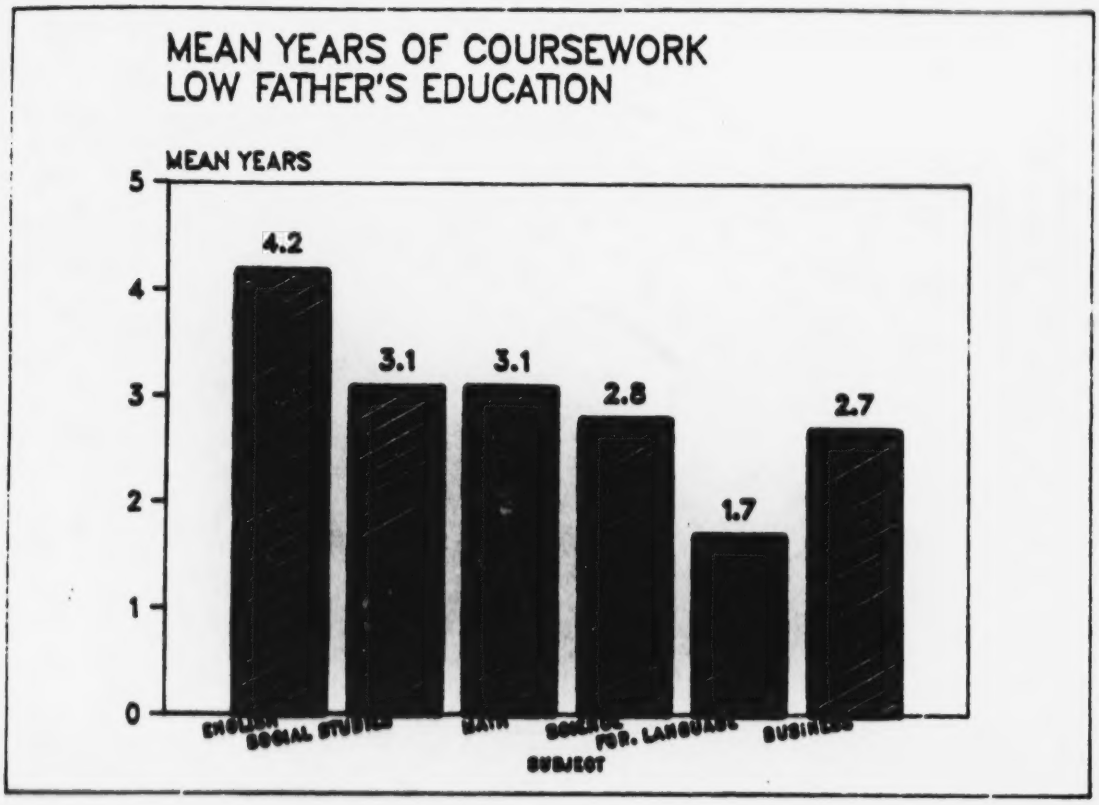
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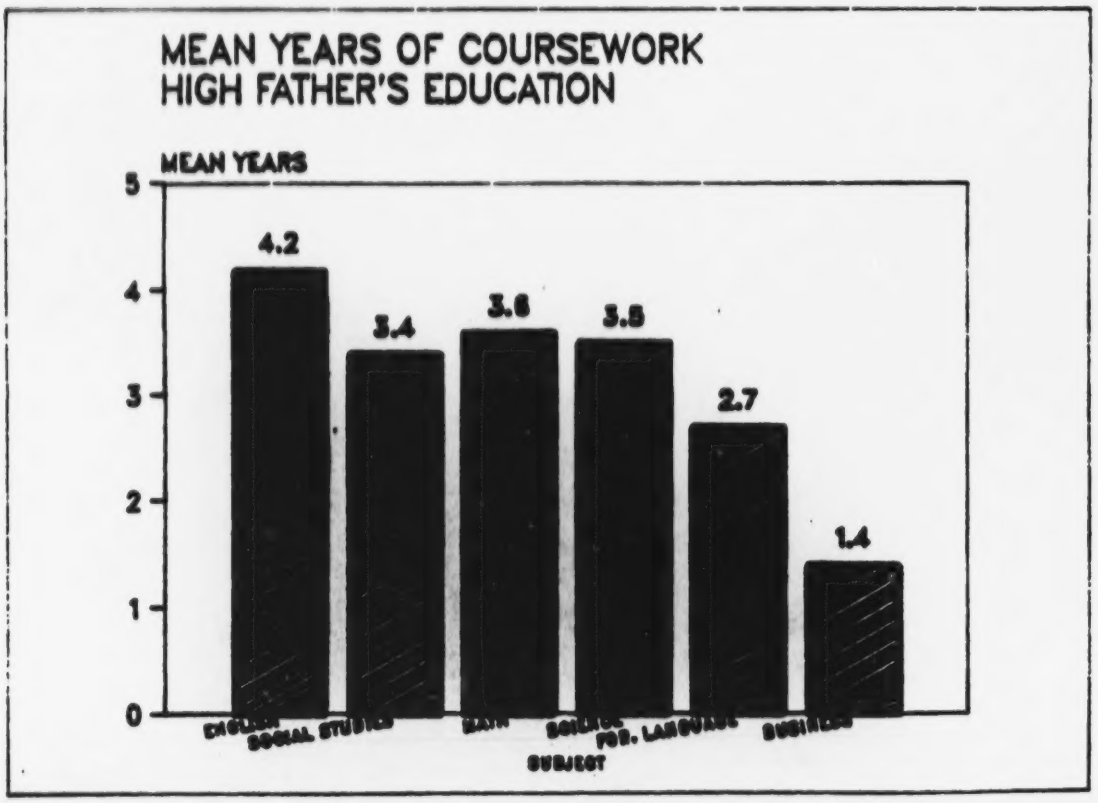
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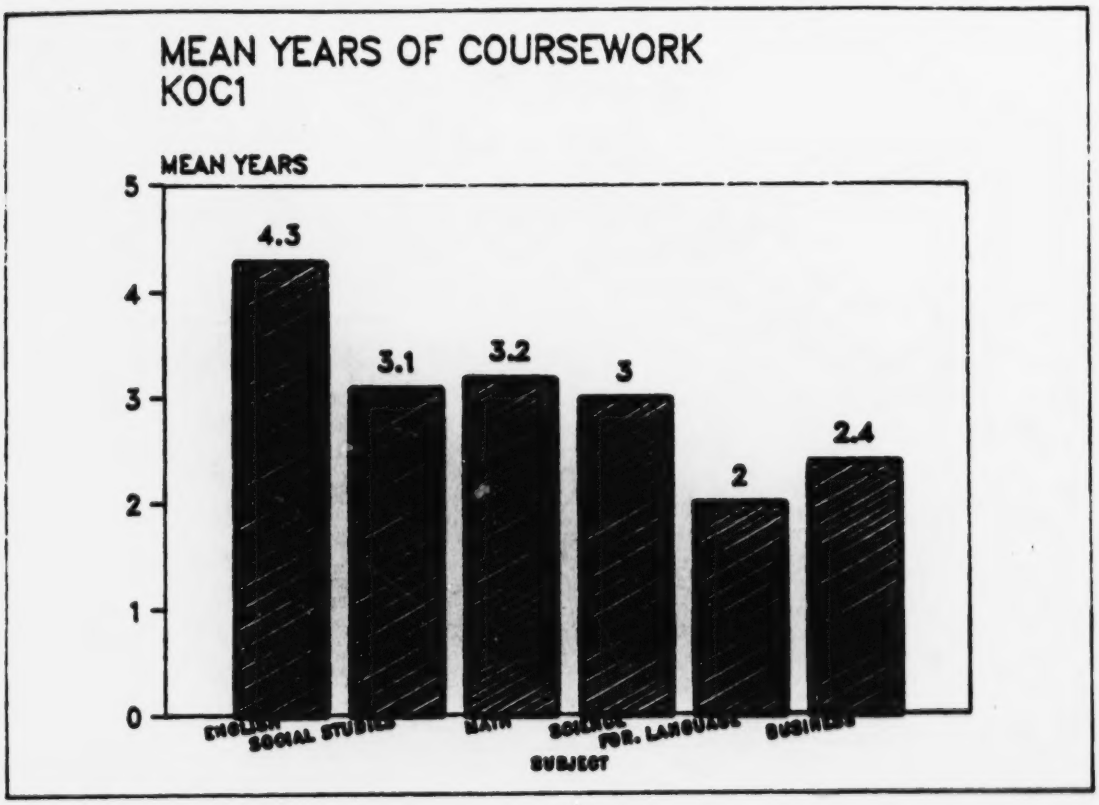
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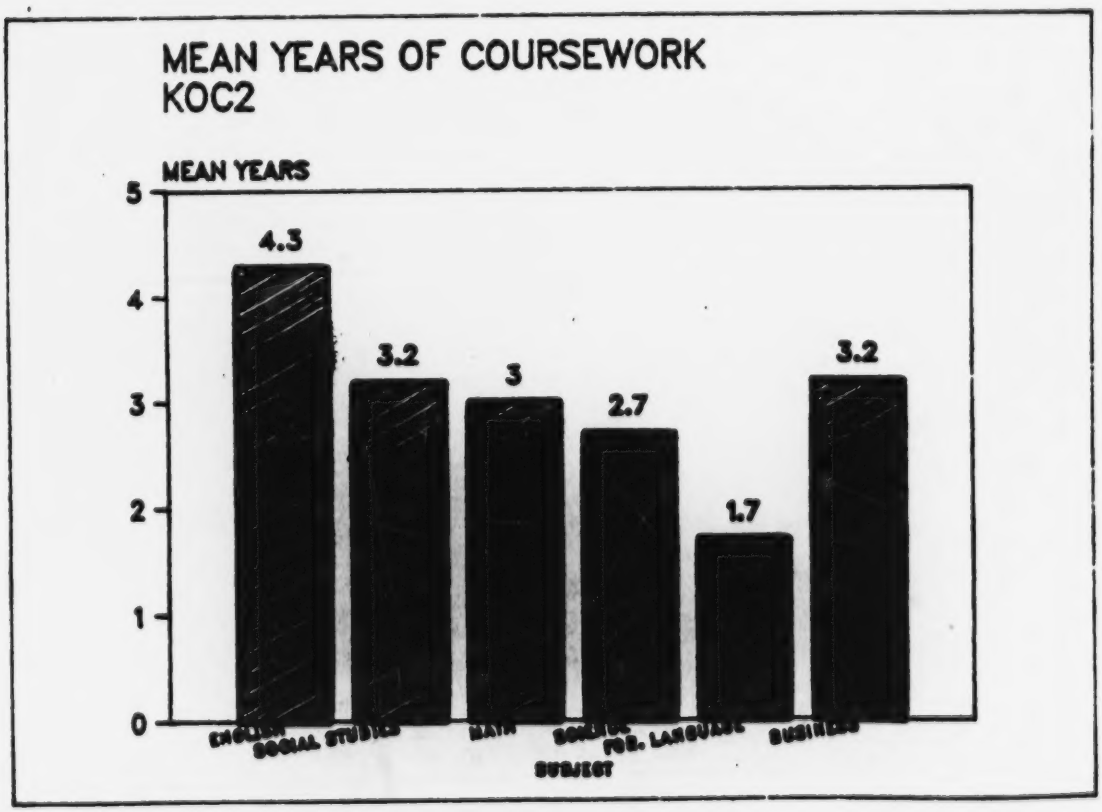
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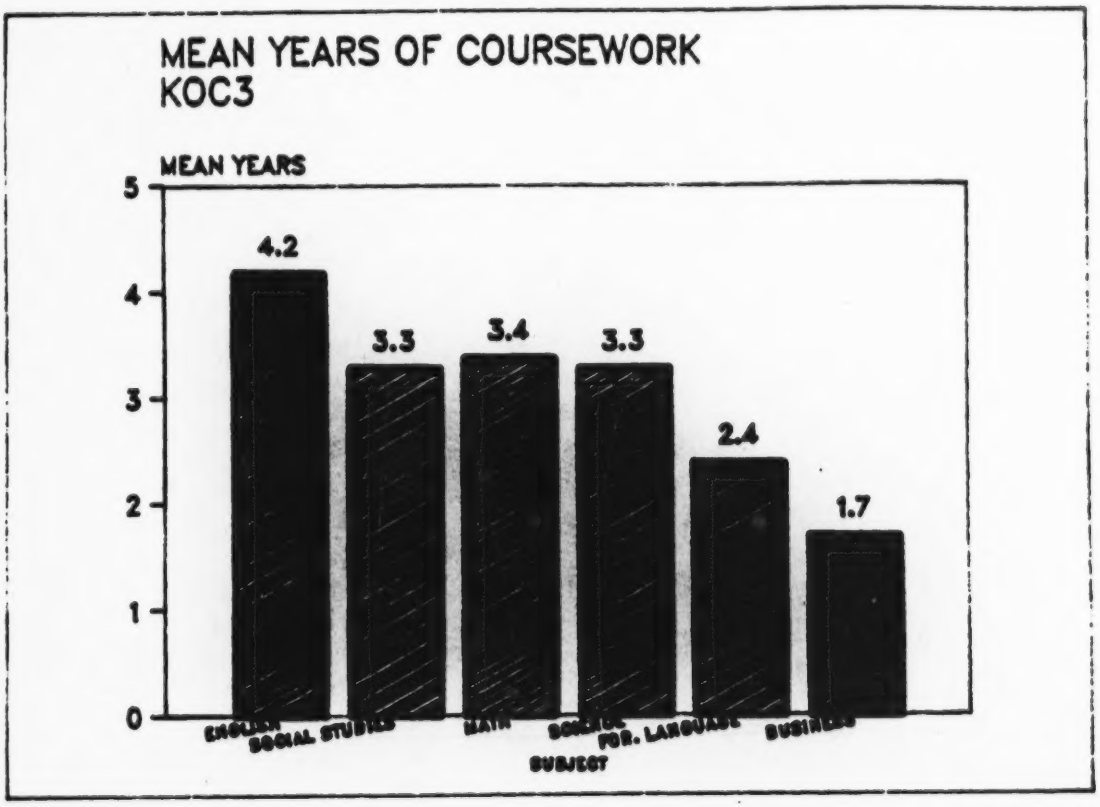
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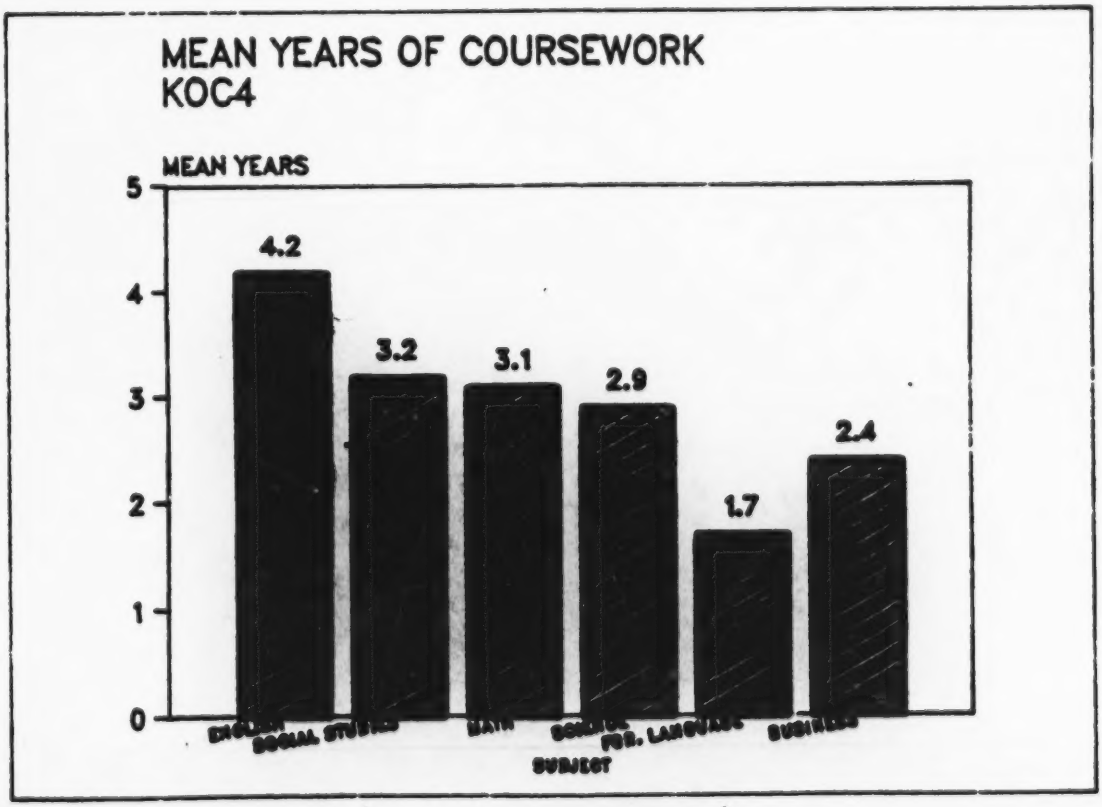
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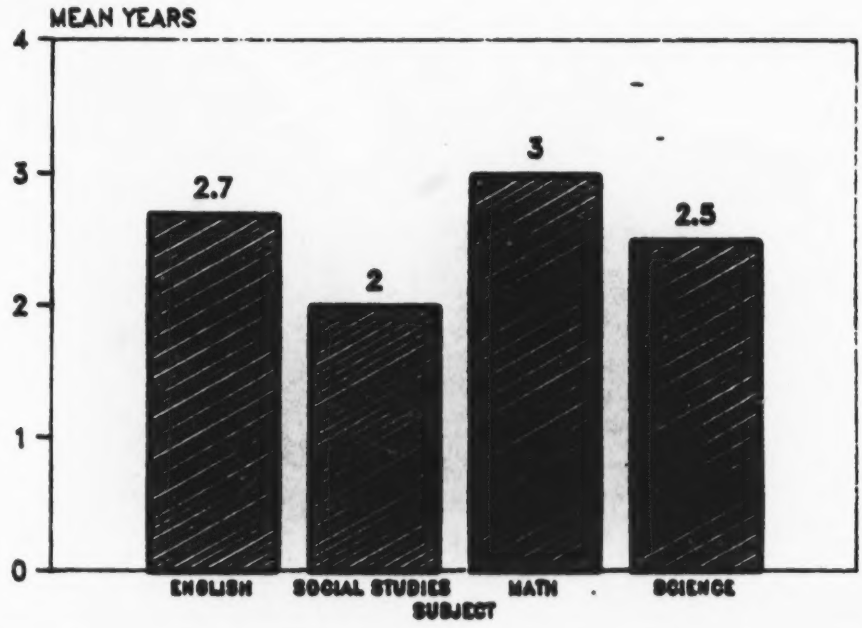
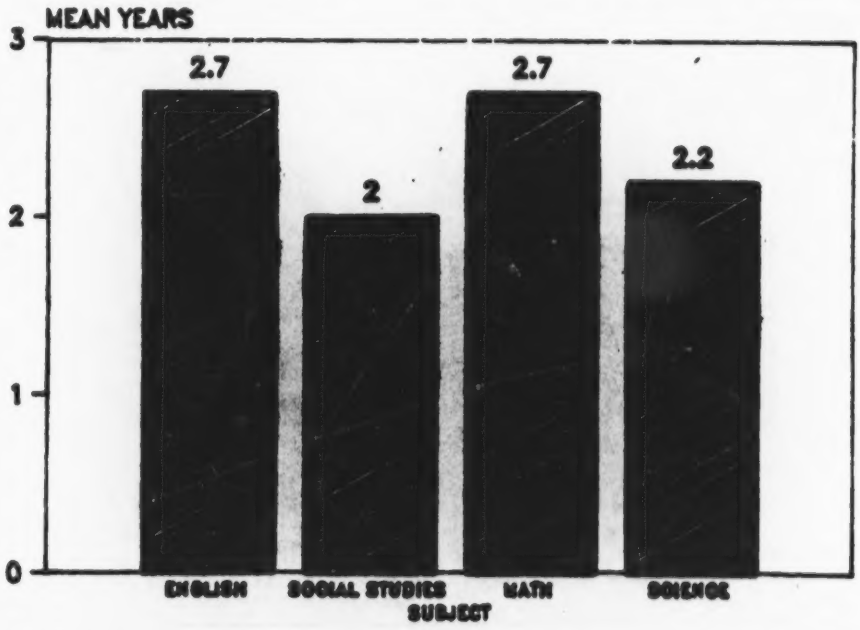
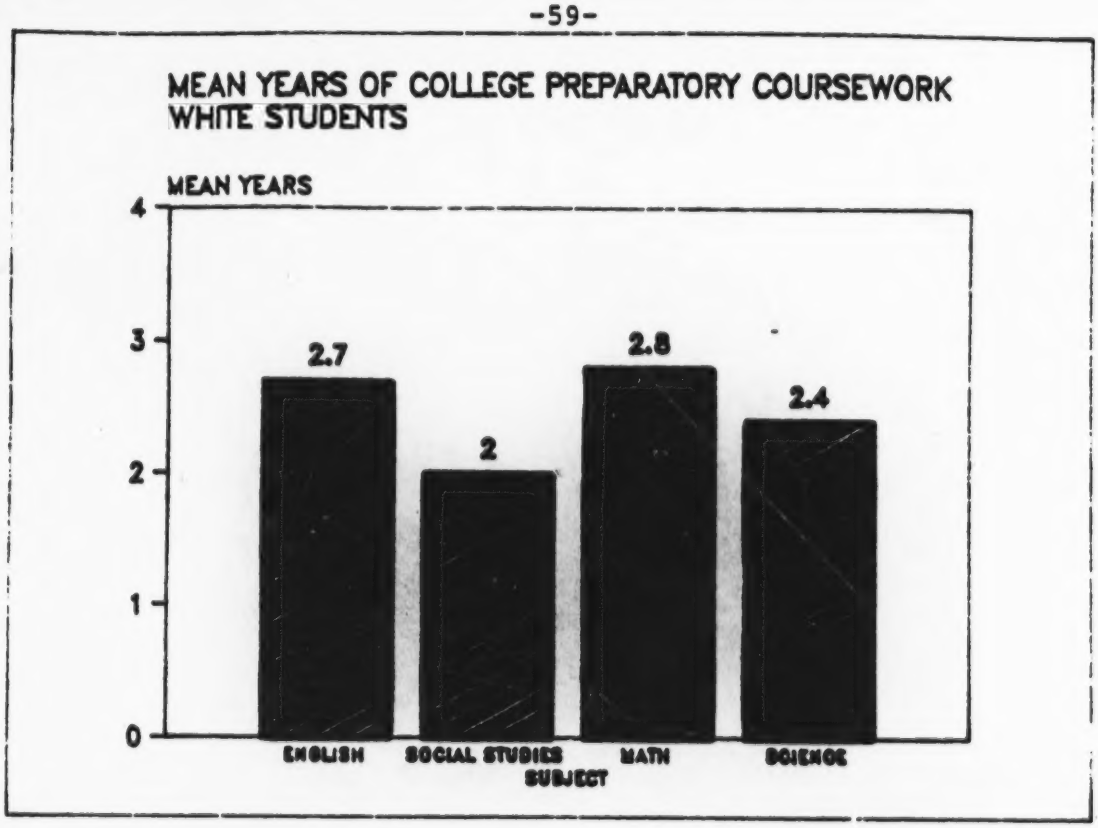
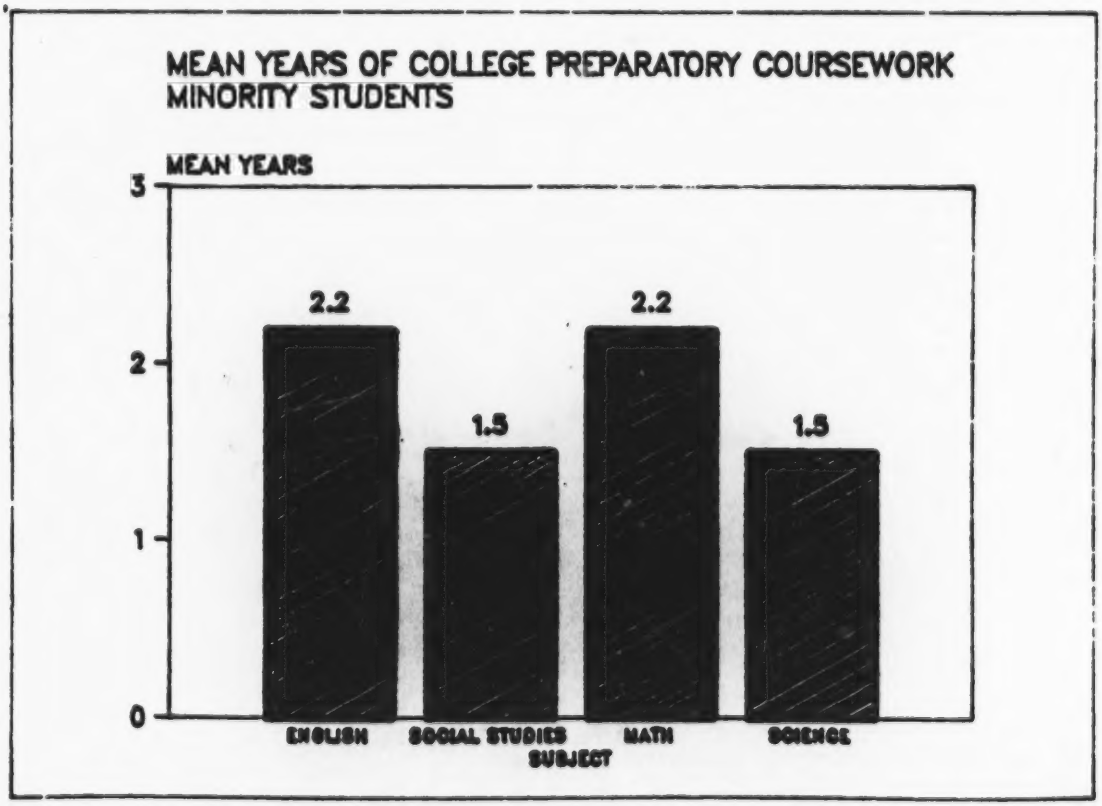
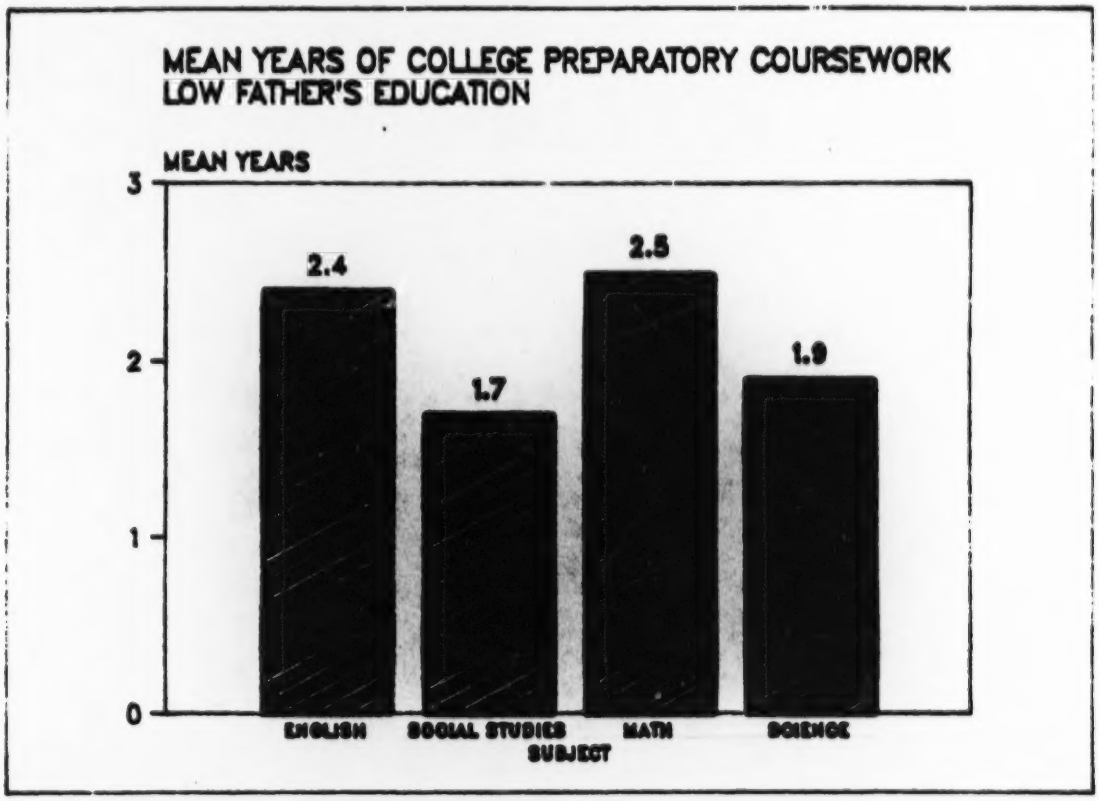


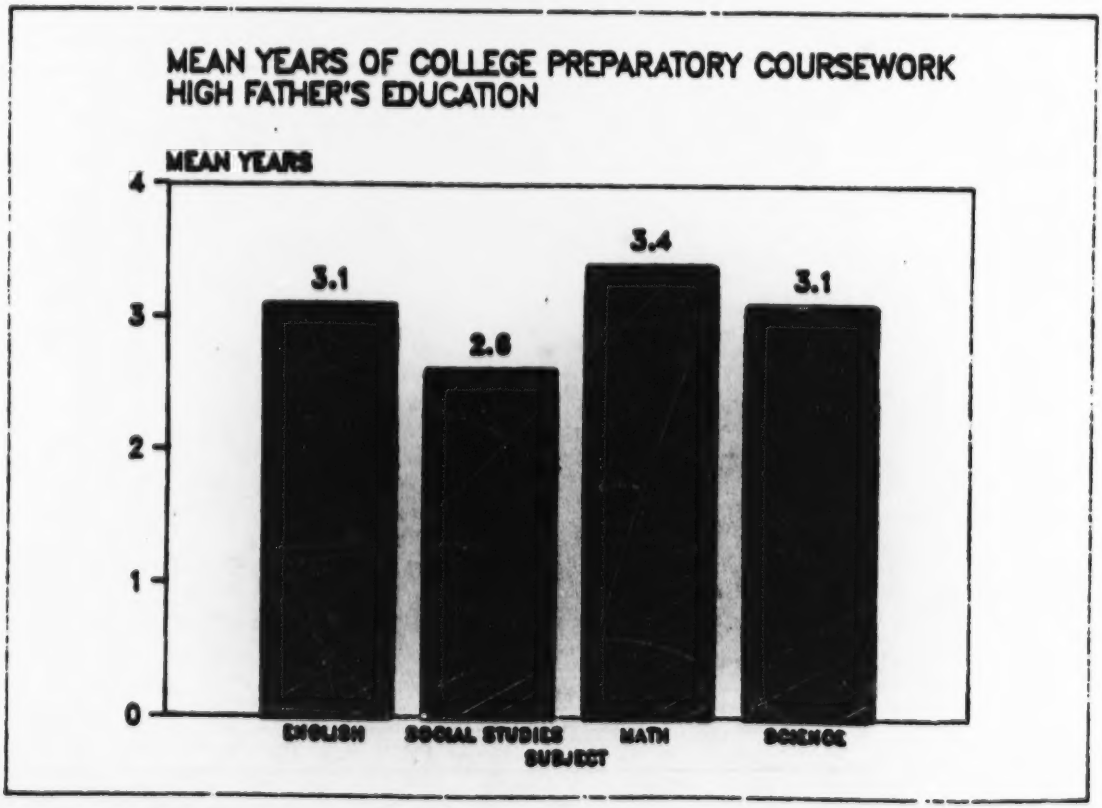
MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
FEMALE



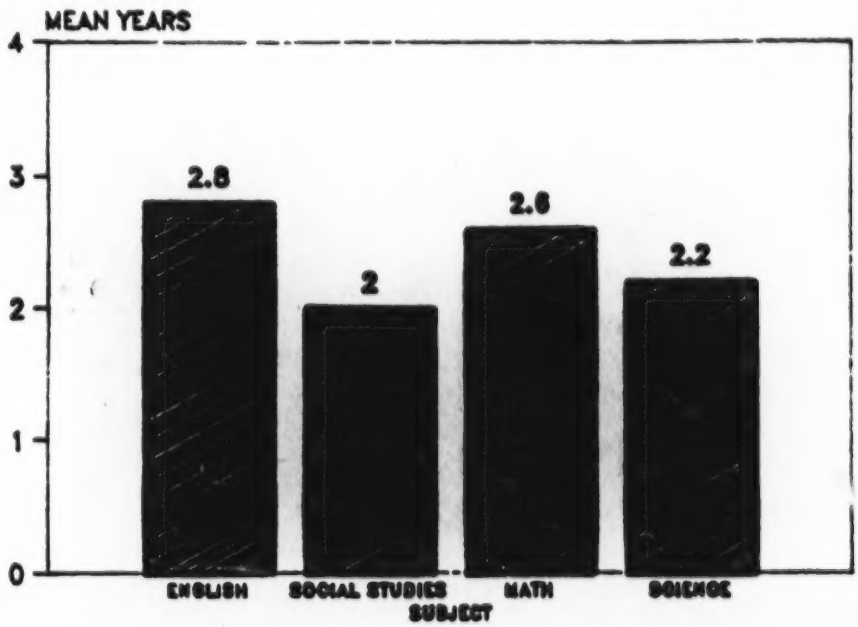

MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
WHITE STUDENTS
MEAN YEARS
4
3
2
1
0
2.7
2
2.8
2.4
ENGLISH
SOCIAL STUDIES
MATH
SCIENCE
SUBJECT


MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
MINORITY STUDENTS
MEAN YEARS
3
2
1
0
2.2
1.5
2.2
1.5
ENGLISH
SOCIAL STUDIES
MATH
SCIENCE
SUBJECT

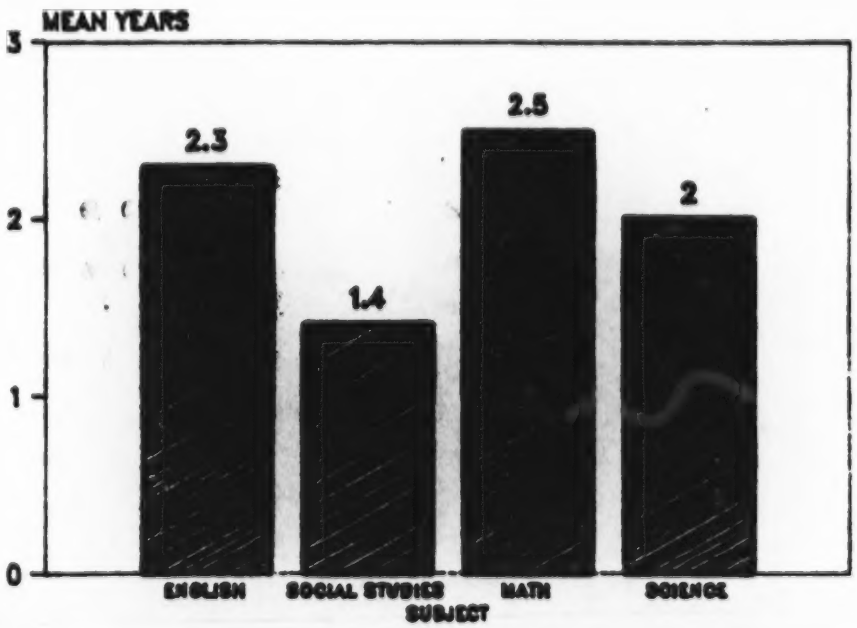

MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
LOW FATHER'S EDUCATION
MEAN YEARS
3
2
1
0
2.4
1.7
2.5
1.9
ENGLISH
SOCIAL STUDIES
MATH
SCIENCE
SUBJECT


MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
HIGH FATHER'S EDUCATION
MEAN YEARS
4
3
2
1
0
3.1
2.6
3.4
3.1
ENGLISH
SOCIAL STUDIES
MATH
SCIENCE
SUBJECT

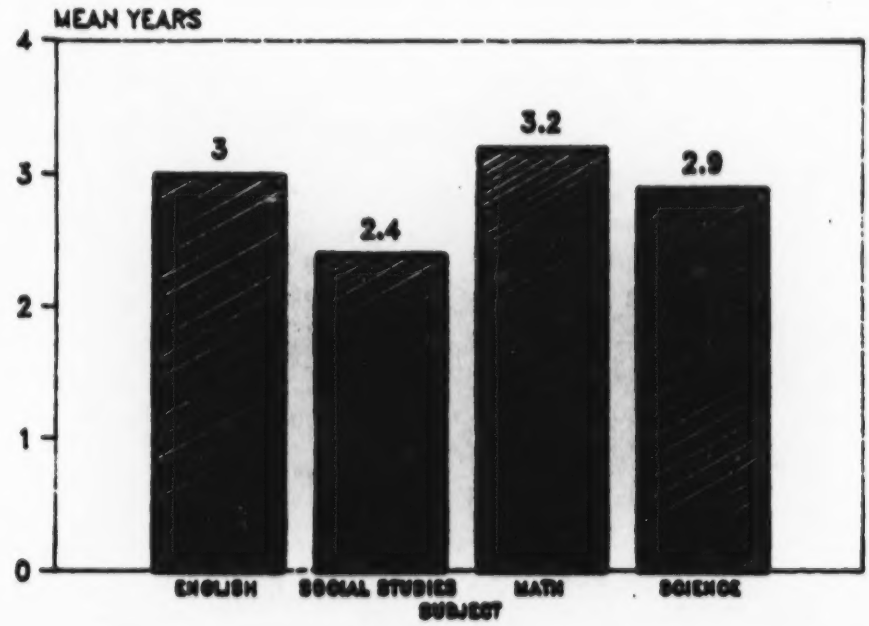
MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
KOC1



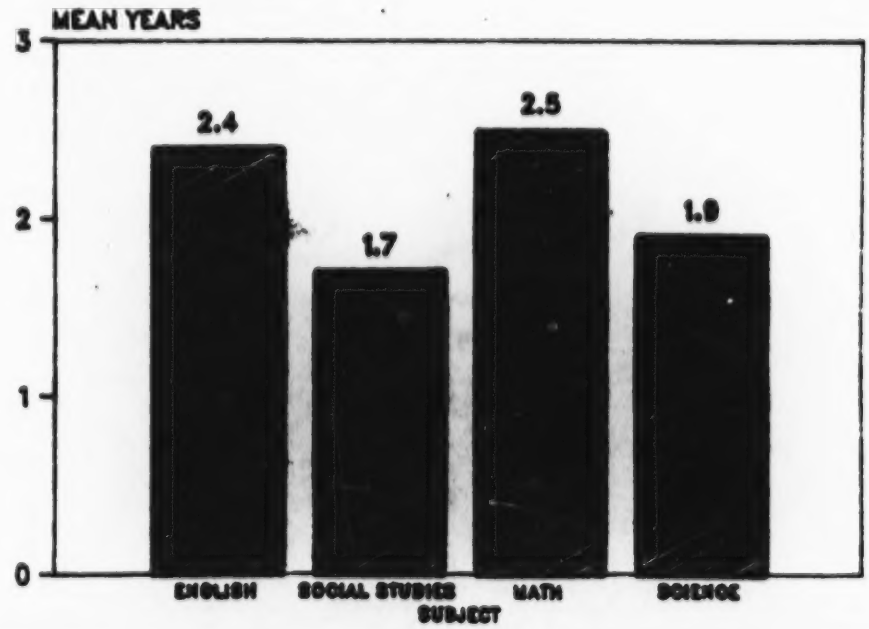
MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
KOC2



MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
KOC3



MEAN YEARS OF COLLEGE PREPARATORY COURSEWORK
KOC4



All Students	High Academic Students	Occupational Students	Non-Directed Students
95.3% white	97.5% white	94.0% white	93.5% white
3.5% minority*	1.2% minority	5.5% minority	6.5% minority
18.4% KOC 1	16.2% KOC 1	18.6% KOC 1	25.7% KOC 1
11.3% KOC 2	8.6% KOC 2	18.3% KOC 2	15.1% KOC 2
42.9% KOC 3	55.4% KOC 3	30.4% KOC 3	23.6% KOC 3
27.4% KOC 4	19.9% KOC 4	32.6% KOC 4	35.6% KOC 4
44.0% Male	44.0% Male	29.0% Male	53.0% Male
56.0% Female	55.0% Female	71.0% Female	47.0% Female
30.0% High Father's Ed.	66.0% High Father's Ed.	15.0% High Father's Ed.	21.0% High Father's Ed.
42.0% Low Father's Ed.	34.0% Low Father's Ed.	85.0% Low Father's Ed.	79.0% Low Father's Ed.

*Includes Black and Hispanic Students

All Students	Students Who Take Algebra I and a Foreign Language Course in Grade 8
95.3% white	95.9% white
3.5% minority*	.7% minority*
18.4% KOC 1	13.5% KOC 1
11.3% KOC 2	9.8% KOC 2
42.9% KOC 3	54.7% KOC 3
27.4% KOC 4	22.0% KOC 4
44.0% Male	41.6% Male
56.0% Female	58.4% Female
30.0% High Father's Ed.	47.0% High Father's Ed.
42.0% Low Father's Ed.	28.7% Low Father's Ed.

*includes Black and Hispanic Students